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Agriculture.

THE MONEY-MAKING VALUE OF GOOD BREEDING IN CROPS AND STOCK.

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[Paper read before the Wide Bay and Burnett Pastoral and Agricultural Society.]

It can be taken as a self-evident truth that the object of each man on the land is to make money. Each man's farm or holding is purely a business into which he has put a certain amount of capital, and on which he expends each year a considerable amount of money and work. The returns each year, or, rather, the average returns over a number of years, should be sufficient (*a*) to cover interest on the capital invested, (*b*) to pay an adequate wage for all labour expended on the farm, (*c*) to cover the annual expenditure on seed, manure, utensils, repairs, &c.—in fact, all those expenses incidental to the running of the farm—(*d*) to provide a reserve to cover depreciation of buildings, equipment, and working stock, and (*e*) to yield some surplus for the purpose of expansion and development.

This statement seems to be quite obvious and simple. And if anyone cared to run a farm with paid labour only, then a set of books would have to be kept setting forth accurately each of the above-mentioned items. The simplicity of the question, however, immediately disappears when we consider the case of a man working his own property. Here the man's own labour, and often the labour of his family, is put into the property without any fixed monetary value being allocated to it. Thus part of such labour may reasonably be devoted to improvements, and the money value of this should rightly be set against the capital invested. Again, some of the work done will be assuredly devoted to repairs or to some other item of farm work, and it should be recorded against that special section at its full monetary value. In this way only can we hope to get a clear idea of whether a farm is paying legitimate profits or not. Instead of adopting any such system of clear book-keeping, the general farmer merely takes his net revenue at the end of the year or at odd times during the year, as represented by his balance at the bank. He is certainly not in a position to say whether his and his family's labour has or has not earned a fair daily or hourly wage. I think it is because of the lack of definite ideas in this regard that farmers generally are so careless about their labour. They have no clear idea of the value of their day's work, and so, in a vast number of cases,

they unconsciously place their labour at a very low figure. This must be the case, or else we would not find so many farmers willingly wasting a great deal of effort.

There are several ways in which a farmer may waste effort. For example, he may prepare his land for planting in a careless and indifferent manner, with the result that no crop has a chance to grow and yield a satisfactory harvest. This low return gives the measure for the payment of the labour expended. In many such cases a little extra cultivation, a little extra labour given to the preparation of the land, would have ensured a double or threefold crop.

In a similar way a farm can be badly or well laid out. If badly designed it is quite possible that both man and beast are called on to waste a fair amount of each day, say, in travelling to and from paddocks, opening and shutting numerous badly constructed gates, and so on. This question of planning the farm is of much more importance than would appear on the surface, and it is so recognised in the U.S.A., where they have developed the profession of "rural engineer" for the express purpose of assisting farmers to reconstruct the layout of their farms.

However, I do not wish to speak of these two ways of wasting effort. Where such wastage takes place it is generally quite evident if the individual will merely stop and think and study his own work. The particular form of wastage of effort I wish to speak about is that which is due to the use of poor-bred seeds and stock. Here the wastage of effort is not so self-evident, yet there is no other section of the farm where a greater wastage of time and labour can be involved. Reversing the statement, we might put it this way:—Nothing makes so greatly for prosperity on the farm as well-bred seeds and stock.

SEED BREEDING.

Let me deal with seeds first. How often do we see a man spend a large amount of effort in preparing land for planting and then find that he has purchased the very cheapest seed available in order to plant. Surely this is deliberately putting a low price on his labour. If seed is cheap it is natural to suppose that it is also inferior. It may not be true to name; that is, it may contain considerable quantities of varieties which are unsuitable for the district, or it may be weak in germination. In either case a poor crop is almost certain to result. To wilfully accept a low yield of crop can only have one effect: it must put a low valuation on the labour expended in the preparation of the land, harvesting, and other activities. That is, the man who buys poor seed deliberately rates his labour at a low figure, and in consequence has no right to complain if his farming operations show no fair profits. Or we might put the matter this way: Suppose a man has engaged all the labour required to grow the crop and has paid this labour a fair wage, he would have no right to try and cut down the wages merely because he purchased such poor seed that the resulting crop was unpayable. The fault would be entirely the employer's, because he had been "penny wise and pound foolish" in his expenditure on seed. Now I want to emphasise the fact that this matter of well-bred seed of high productive value is a big thing. Good seed may easily give from 25 per cent. to 50 per cent. greater yield than poor seed, and this for no other expenditure than that involved in the slightly higher price paid for the seed.

To illustrate this we might mention the work that has been done in several other countries, notably Sweden, Canada, and Denmark. In Sweden, which was a grain-exporting country, it was found by 1870 that the competition from overseas began to be felt to such an extent as to threaten the prosperity of the graingrowers of the country. In 1886 the Swedish Seed Association was formed for the purpose of developing better yielding varieties, and the Society's work resolved itself into:—

(*a*) Procuring good yielding varieties from other countries;
(*b*) Finding the best yielding native varieties;
(*c*) Growing these side by side and comparing their yields;
(*d*) Eliminating the poor varieties and propagating the good till a stock had been accumulated;
(*e*) Keeping the good varieties pure and purifying the impure; and
(*f*) Distributing the good seed amongst members and other farmers.

This association acquired land at Svalöf, and for the first ten or twelve years it accomplished little beyond the finding and testing of varieties and the keeping of the best of these up to the standard of purity. Attempts were made to improve some varieties, but with little success. Later, however, Professor Nilsson was appointed in charge, and he, in the light of later knowledge of the laws governing breeding which had recently been discovered, introduced new methods, with the result that Sweden now has improved varieties of cereals which are capable of giving up to 50 per cent. better yields than were given by the best of the old varieties.

Somewhat similar results have been obtained with a variety of crops in Canada, Denmark, Germany, several of the United States, and in Australia with regard to our wheats. But while some of these countries have well-established co-operative societies, whose efforts are devoted to the propagation of pure types and the improvement of varieties, others, like Australia, depend on a few Government farms and Government-paid experts to carry out this vitally important work of improvement, and leave the distribution of the improved varieties to our commercial seedsmen. It is in this latter regard that our system is so weak. It would not be possible within the limits of a single article to give a full description of how this weakness arises, but I will endeavour to give some indication of it, as the matter is so important. Suppose we take a variety of wheat which might have been created, say, by the late Mr. Wm. Farrer. After a number of years of ordinary paddock sowing it can be expected that rogues, that is, foreign strains of wheat, will find their way into the crop. These rogues may, and often do, closely resemble the particular variety grown; that is, as far as the seed appearance goes. But they may differ very widely from the type, both as regards yield and disease resistance. Thus what was a good pure variety is almost certain, with time, to become a mixture of strains. When this happens we say that that variety has run out. In the vast majority of cases these so-called run-out varieties could be re-established under a proper system of pure breeding at a well-equipped seed-propagating station. Above I have spoken of wheat, which is a normally self-fertilising plant. We have a totally different case when we consider crops such as maize, pumpkins, sorghums, and other plants, which are normally cross-fertilised, or which cross-fertilise easily. In these cases varieties may be quickly lost, or be so hybridised as to become of low value. On the other hand, good and heavy-yielding types may very frequently be obtained by special selection in the field. Thus, with maize we have a very useful system of selection and propagation known as the remnant system. For this the first thing to do is to select in the field cobs from heavily yielding plants, but, above all, to select heavily yielding cobs. Next season one half of each cob is planted in a row, each cob being represented by a separate row. Each row is harvested separately, and the five heaviest yielding rows are selected for the propagation of the seed maize. For this purpose the original cobs are again resorted to; that is, the half of the cobs which were first selected in the field, and which gave the heaviest yield on trial. These five are then planted in hills, one seed from each cob in each hill, but the heaviest yielder in the centre of the other four. Repeat in as many hills as will give the amount of seed required for field planting. It is necessary to state that these hills must be well away from any other growing maize so as to obviate outside fertilisation. When the plants in the hills show the first signs of tasselling, each of the plants in each hill, except the centre or highest yielding plant, are de-tasselled. Thus it is secure that the four outside plants are fertilised by the central plant. The future seed is taken from the outside plants only in each hill.

Similar methods might be adopted for pumpkins, though the actual working arrangement would not be so simple as with maize. However, it is not necessary now to describe methods of improving seed; the control of this work is largely the work of experts. What is more immediately essential is the matter of the money-making value of well-bred seed, and I think it is obvious that it would pay to give double price for our seed, always provided we could be sure that its yielding qualities were of a high order. On the other hand, poor seed can only be expensive, no matter how low a price at which it is bought. The only point to be considered is: How can we act so as to ensure that we shall get the high quality seed required?

First, all must be prepared to pay a higher price for their seeds.

Second, everyone must insist on seeing that the seed sold is up to the standard advertised. In this respect it must be remembered that the Queensland Government has a Pure Seeds Act in existence, which can do much to assist us, provided we will take the trouble to insist that all our seed shall not only be guaranteed as up to sample, but is also occasionally tested or retested so as to ensure that the guarantee is correct.

Third, cut out entirely the purchase of seeds of unknown origin.

Fourth, form among ourselves a Good Seeds Association and keep it a live body. Collectively one can secure much more protection than if one attempted to act individually.

As a Good Seeds Association, keep in view the probability of establishing our own seed-propagating farm, with or without Government assistance.

The "Agricultural Gazette of New South Wales" says:—The regulations of the Canadian Pure Seeds Association are as follow:—

"1. Membership of the association is open and free to any *bonâ fide* farmer who has shown himself capable of producing improved pure seed.

"2. The farmer who undertakes to grow pure seed obtains his foundation stock from the Association. Such seed is either 'first generation registered seed' (*i.e.*, the first, second, or third generation progeny of an improved selected strain) or 'elite stock seed' (a pure stock of seed originating from a single plant, or obtained from a hand-selected seed plot).

"3. Any seed of any kind of crop produced or selected by a member during the succeeding years is entitled to registration by the Association.

"4. Two kinds of certificates are given by the Association—(1) for seed which has been grown according to regulations, and descended from 'elite stock seed,' such seed being marked 'registered seed' and (2) for pure 'elite stock seed.'

"5. No certificates are issued unless the seed be (*a*) pure as to variety and true to type; (*b*) free from seeds of other cultivated plants; (*c*) free from seeds of weeds coming within the meaning of the term 'noxious weeds' as applied by the Seed Control Act; (*d*) free from or containing not more than a total of one seed of other weeds of minor importance; (*e*) well matured, clean, sound, plump, of good size and colour, and free from disease; (*f*) up to the percentage standard of vitality recognised for good seed of the kind under the Seed Control Act.

"The methods thus outlined are eminently successful. Already the membership of the Association runs into considerable numbers, and the demand for 'registered seed' is greater than the supply.

"The Department of Agriculture in New South Wales has already taken the initial steps for the production of better seed, and the lines upon which it is proceeding have already been indicated in the 'Gazette.' The method adopted differs from those in Canada and Sweden in the fact that the Department deals directly with the farmer. The principle of producing pure improved seed is such a vital one that the scheme merits the attention and co-operation of all good farmers."

STOCK BREEDING.

Here we have exactly the same argument as before, viz., that the man who is willing to work with poor quality stock is willing to accept a low wage for his labour. With stock this is even more obvious than with seeds. Further, it lies in the hands of each man to be his own improver, which is not the case always with plants. However, co-operation is of undoubted advantage in any district just as it is in the case of developing good seeds.

To illustrate this argument I am taking dairy stock, not because dairy animals are the only ones affected, but because the yield from dairy stock is so easily measured, and because we have many reliable figures upon which to base our argument. Thus we know that a great number of so-called dairy cows produce less than 150 lb. of butter per year, while others give higher yields, until we have the Australian record producer, Melba 15th, a cow that has recently put up the splendid record of 1,150 lb. of commercial butter in the 365 days. Naturally, Melba 15th was specially cared for and fed, but we know of many animals which are capable of putting up 400 or even 500 lb. of butter in the year with no better care or pasturage than that given to the 150-lb. cow. Not to exaggerate the argument, let us compare the 400-lb. cows with those yielding only 150 lb. of butter per year. I use the 150-lb. cow as the lower limit because the indications are that this figure is somewhere near the average yield for all dairy cows in Queensland.

Let us assume that one man can look after and milk fifteen cows, each giving 150 lb. of butter per year. Also let us assume that each cow requires 3 acres of grazing, the rental value of which is 10s. per acre per year. Let us finally assume that the value of each pound of butter is 1s. 3d. Then for our fifteen cows of 150 lb. capacity we have the following financial statement:—

	£	s.	d.
Cost of labour for care of animals and milking, say ..	130	0	0
Cost of grazing for each cow is 3 acres at 10s. = 30s.; therefore cost of grazing for the 15 cows is	22	10	0
Total	£152	10	0

or £10 3s. 4d. per cow.

The returns per cow = 150 lb. of butter at 1s. 3d. per lb. = £9 7s. 6d. Now, if the man is the owner of the cows and is doing his own work, he will not have actually paid out the assumed £130 in wages. If he had he would have made a loss of 15s. 10d. per cow per year, or a total of £9 12s. 6d. for the fifteen cows. What this really means is that the owner of the cows did not actually lose; he was merely content to accept £130, less £9 12s. 6d., or £120 7s. 6d., as a reward for his labour.

Let us now consider the case of a herd of cows each giving 400 lb. of butter per year. We will assume all the above figures, except that we will presume that a man can only look after and milk twelve of these heavier milkers.

In this case the financial statement runs out as follows:—

	£	s.	d.
Cost of labour for care and milking, say	130	0	0
Cost of pasturage for the 12 cows—30s. per cow as before ..	18	0	0
Total	£140	0	0

or £12 6s. 8d. per cow.

The returns per cow are 400 lb. of butter at 1s. 3d. per lb., a total of £25, or £300 for the twelve cows. Thus, if the man is the owner and is doing his own work, he would not have to value his labour as low as £130. Instead, he would be able to value his labour at £300, less the £18 for pasturage, or at £282 per year. In truth he would have put a value on his labour of nearly two and a-half times that which it is necessary to place on the labour of the man with the fifteen cows which only produce 150 lb. of butter each per year.

It may be claimed that the high producers would be very expensive to buy, and so they should be if they were proved animals. But one would not secure these high producers by direct purchase. It is doubtful if one could, even if he wished to and had the necessary cash. There is another way in which we get such good animals, but more of this later. Before going on, however, I should like to state that I know of a case at a factory in the Lockyer district where a man milking fifteen cows has been drawing for months past a cheque of £45 or more, while a neighbour of his who is milking, roughly, an average of forty-five is not drawing as big a monthly cheque. Thus the figures worked out above are no exaggeration on cases that we find in actual practice.

But let us consider the case of a man running beef stock. In this class of animal it is possible to have some that will not mature or be fit for market until they are five years of age, while at the other extreme we can get some which can be prepared for market at eighteen months, and which will then be heavier than the poorer class at five years of age. Let us set out an example similar to that for good and poor dairy stock, and again, so as not to exaggerate the case, let us take a class of animal which mature at four years old as against a better class which mature at three years. Suppose that a man has a property which will run 400 head. With the poorer quality stock he should be able to market 100 head per year, provided he intends to market a regular number each year. On the other hand, if he had stocked up with the better quality animals he would be able to market an average of 133 head per year. Granted that the animals are of the same value at the time of marketing, though in all probability the younger stock would command the better prices, we have an annual return for the poorer stock of £1,000 per year, and for the better stock of £1,300, on the assumption of a market value of £10 per head. This shows a difference of £300 in favour of the better class animal, with no increased cost for care and management and pasturage. Certainly the better class stock would be more expensive if they were purchased for stocking-up purposes, but, even so, they would scarcely be £2 per head dearer as weaners than the poorer quality stock. But here again, as with the dairy stock, a man would not buy his high class animals; he would adopt the cheaper method of breeding them.

Now let me return to a dairy herd to indicate how it is possible for each man to improve his milkers.

1. The first essential is that each cow should be tested each year to see exactly what she is giving. Any cow below the standard one sets for one's self should be culled. She costs money to keep instead of making money for the owner. Or, to put it another way, she gives such a low return that she lowers the available wage for the working owner.

2. The next step is to secure a bull from a high-producing family. To ensure this it is necessary that the production of the dam, the g. dam, and, if possible, the gg. dam, should be known. Also the production of the bull's sire's dam and g. dam. To obtain this information it is obvious that consistent testing of animals must have been going on for a number of years.

3. It is next necessary to test the production of each of the heifers produced, and she should yield as highly as her dam, or higher, or else the bull is not doing any improving; that is, the bull you buy must be tested through his heifers.

4. The bull bought should be a pure-bred, and bulls to follow him should be of the same breed. I do not intend to deal with the reasons for this, as it would take another complete paper to do so. Here I can only state it for a fact, always provided the pure-bred bull satisfies condition 2.

5. Once a bull has been proved to be a great improver, and occasionally a bull will be discovered which is such, he should be used to the utmost of his vigour. If not by his first owner, then by succeeding owners, who should be only too anxious to get hold of a proved sire.

It is evident that the discovery of such an effective sire would be greatly assisted if a number of men in any one district were all working on the same lines and were using bulls of the same pure breed. Further, this would render the sale of a proved sire easier of accomplishment.

In short, the foregoing suggestion boils down to the advice to form a proper herd testing and breeding association. That such an association can accomplish much is indicated by the following:—

Denmark has been testing her cows for over half a century, and it is authoritatively stated that the estimated yield per cow was 80 lb. in 1864, 116 lb. in 1887, and 220 lb. of butter in 1908. This is a gain of nearly 300 per cent.

Recently Mr. Singleton, Assistant Director of the Dairy Division of the New Zealand Government, published the following figures:—

He said that at the last census they had 793,215 dairy cows for 1916-17 season. He estimated the average yield per cow at 161.8 lb.of butter-fat (about 195 lb. of commercial butter) as against 142.1 lb. of butter-fat (about 171.2 lb. of commercial butter) for 1910-11, or an increase of 23.8 lb. of commercial butter per cow in six years. This represented an increased export value of £1,276,000, besides an increase in the by-products. Mr. Singleton gave figures to show the good results of the Department's testing to assist the farmers to cull their herds. One man was getting more butter-fat from twenty-five cows than previously he got from fifty-four cows.

The foregoing speaks for itself, and indicates what can be accomplished from consistent herd-testing. Similar work is being carried out in Victoria and New South Wales.

The statement quoted, however, does not truly represent what can be accomplished, for it only deals with the averages, and it can be taken that the greater number of dairy farmers are either too careless or are so adversely placed that consistent herd-testing cannot be carried out. Therefore the improvement in those herds which do practise testing must be much greater than the figures indicate. Thus, we know of a few privately owned herds which average over 400 lb. of butter per cow per year. These men have attained their position by careful testing and culling and breeding for the best. What they can do, all can do, but much more easily if they combine in a well-organised herd testing and breeding association.

ELEPHANT GRASS AS A FODDER, AND NOTES ON SOME OTHER FODDERS.

BY J. C. BRUNNICH.

Elephant grass (Pennisetum purpureum), also called Napier's fodder, one of the introduced South African grasses, has recently gained some prominence amongst farmers, inasmuch that it yields heavy crops and does not appear to be much affected by droughty conditions.

Special claims for its great feeding value at all stages of growth have been made, and in order to ascertain the truth of such statements several samples, of various stages of growth, from different localities, were obtained and analysed.

The analyses given below clearly show that only very young elephant grass can be classed as a fodder of fair quality, which has, however, only about half the value of couch grasses or of prairie grass as a feed for cows, and that with age the food value rapidly declines and becomes very low when maturity is reached. The protein contents of this grass are low and not as good as of sorghum or of sugar-cane tops, but about equal to that of Indian or cow cane. Most of our grasses, sorghums, &c., are deficient in proteins, the most valuable flesh-forming constituent of foods, and only few fodders like lucerne, cow pea vines, salt bush, sheep's burnett, and couch grass contain a sufficient amount of proteins for balanced rations, whereas the rations of the former must be supplemented with sufficient amounts of concentrated foods, like linseed meal, cotton seed meal, sunlight oil cake, bran, dried blood meal, &c., to get a properly balanced food ration.

A well-balanced ration for a cow should have a nutritive or albuminoid ratio of 1 ÷ 5, which means the ration should contain one part of digestible protein or albuminoid to five parts of digestible non-nitrogenous nutrients, including sugar, starch, cellulose, or fibre and fat.

The best method to judge the food value of any fodder in a simple practical way is based on the amounts of fodder required to furnish an animal with the necessary amount of nutrients, and for this purpose a cow of 750 lb. to 900 lb. live weight, yielding about 25 lb. of milk daily, is taken as a basis for calculation. Such a cow requires per day an amount of fodder containing at least about 1.9 lb. or nearly 2 lb. of digestible protein, and about 11 lb. of starch value, which includes all the digestible carbohydrates like sugar, starch, fibre, and also fat, calculated as starch.

In a ration which is properly balanced the amounts of food required to furnish the absolutely necessary amounts of proteins and of non-nitrogenous nutrients, briefly expressed as starch value, should be approximately the same, and we find in the table below that 71 and 79 lb. of couch grass are required for the ration of a cow containing the necessary amounts of nutrients, whereas 132 lb. and 183 lb. of very young elephant grass, and 29 lb. and 380 lb. respectively of mature elephant grass must be fed to give the same amounts of nutrients. The amount of 29 lb. giving the necessary starch value would be found in practice very much higher, on account of the coarseness and hardness of the fibre in the mature elephant grass, which would require a lot of extra energy for mastication and digestion.

—	Moisture.	Crude Protein.	Carbo-hydrates.	Crude Fibre.	Crude Fat.	Crude Ash.	Nutritive Ratio.	Lb. of Fodder to give: 11 lb. of Starch.	Lb. of Fodder to give: 1·9 lb. of Protein
Elephant Grass—	%	%	%	%	%	%		Lb.	Lb.
2 weeks old	85·5	2·1	6·4	4·3	·10	1·6	1 . 7·4	132	183
4 weeks old	83·5	1·3	6·6	6·1	·14	2·4	1 : 14·0	75	297
8 weeks old	78·1	1·7	9·2	7·4	·23	3·4	1 : 14·3	73	229
Mature	73·1	1·4	11·6	11·9	·19	1·8	1 : 23·2	46	268
6 months old (sticks up to 14 feet long)	70 0	1·0	13·8	13·2	·20	1·8	1 : 37·7	29	380
Couch Grass	74·1	4·1	10·0	8·4	·4	3·0	1 : 5·5	71	79
Sorghum	70·6	2·1	15·1	9·1	·6	2·5	1 : 17·9	58	158
Lucerne Hay	8·2	21·0	31·4	25·9	2·8	10·7	1 : 3·3	24	17
Linseed Meal Cake	10·0	36·1	36·7	8·4	3·6	5·2	1 : 1·4	16	6
Pollard	10·0	17·4	58·0	5·2	5·6	3·8	1 : 4·3	15	14

All the samples of elephant grass analysed, and besides them several other samples, including one of very young second cut, were tested for hydrocyanic (prussic) acid, and no trace could be found, so that it may be stated that elephant grass at all stages of growth does not contain a hydrocyanic acid yielding glucoside.

I take the opportunity of drawing attention to the use of many fodders, like most of the grasses belonging to the sorghum family, sweet potato vines, &c., which contain hydrocyanic acid yielding glucosides, as it happens frequently that farmers who successfully use many of these valuable fodders become careless at times, and fatalities among their stock occur.

One of our most valuable concentrated foods, particularly rich in proteins, is *linseed meal,* and although it is a well known fact that all samples of linseed meal contain a considerable amount of such poisonous glucosides, through simple carelessness it happens now and then, fortunately rarely, that calves have been killed by its use. The instructions with regard to preparation of the meal for feeding of calves, and particularly the quantities to be used for calves of various ages, must be strictly adhered to.

Among stock fed with *Soudan grass,* another of the introduced grasses, cases of death have been reported, but it has not been conclusively proved that such mortality was caused by the grass, or perhaps by Johnson grass growing among the Soudan grass. Several samples of Soudan grass, at various stages of growth, have been tested from time to time in our laboratory, but only very slight traces of prussic acid could be detected, so that the grass, under normal conditions of feeding, should be quite harmless.

A cross between Soudan grass and sorghum saccharatum, produced by Mr. Soutter on the Roma State Farm, was found, quite contrary to expectation, absolutely free from cyanogenetic glucoside at all periods of growth.

Sacchaline, a saccharine sorghum, now extensively grown in many localities, contains rather large amounts of a poisonous glucoside, and even up to the time of full maturity of seed heads, dangerously large amounts appear to be present, so

that utmost caution must be used at all times when feeding this sorghum variety. In most other sorghums the amounts of poisonous glucoside diminish with maturity, and when seed heads are fully formed the amounts are so small that the sorghum can be used with absolute safety.

There can be no doubt that cattle fed with fodders containing hydrocyanic-acid-yielding glucosides can eliminate during the process of digestion a fairly large amount of hydrocyanic acid without feeling ill-effects. Only in cases when the animals are in poor health, or if very large quantities of such fodders are consumed during scarcity of other green foods, or by some reason or another, the evolution of the poison is much quicker during digestion than under normal conditions, fatal effects may be caused. It is, for instance, quite possible that, with the fodder containing the poisonous glucoside, another food is consumed which contains a similar poison, or perhaps large amounts of the emulsion, which causes the rapid breaking up of the glucoside during the process of digestion.

It must be again pointed out that wilting and drying of the fodder does not destroy the poisonous glucoside, and the reason why the dried fodders can apparently be fed with greater safety is simply due to the fact that the animal does not consume rapidly such large quantities of the dried fodder as of the succulent green material, and it is also possible that in the dried fodder the decomposition of the glucoside is not so rapid as in the green fodder.

Making any of these fodders into silage causes complete decomposition of the glucoside during the fermentive processes taking place in the silo.

ELEPHANT GRASS (PENNISETUM PURPUREUM): PULPING QUALITIES.

This grass is said to yield about 20 tons dry weight of material to the acre per season. It is a bamboo-like grass, and as received was very moist, the moisture content being 65.4 per cent. The height is about 7 ft., and numerous nodes occur along its length. The following shows the proportion in which the nodes, &c., occur:—

	Per cent.
Internodes	45.0
Nodes	29.0
Leaves	26.0

Its pulping qualities were tried in the small rotary digester, by the usual caustic soda process; particulars of treatment and the results obtained are:—

Caustic soda on the dry material strength of caustic being 77 per cent. sodium oxide (Na_2O)	22.0 per cent.
Period of digestion	6.5 hours.
Time in reaching maximum pressure	1.0 hour
At maximum pressure	5.5 hours
Steam pressure	80.0 lb.
Yields (based on materials and pulps being moisture-free)—	
Unbleached pulp	36.0 per cent.
Bleached pulp	30.0 per cent.
Bleaching powder (on weight of air-dry pulp)	15.0 per cent.
Average length of fibres	0.82 millimetres.
Average diameter of fibres	0.016 millimetres

The maximum length of fibres observed was 4.3 millimetres, but comparatively few were of such length; the minimum length was 0.35 m.m. and, as the largest proportion of fibres were in the vicinity of 0.5 m.m., this accounts for the low average of 0.82 m.m. The average diameter is also low, making for flexibility of fibres, which allows of easy felting together. Approximately 15 per cent. of the total cellulose consists of non-fibrous cells, which on account of their extreme degree of hydration is sometimes the cause of troubles on the machine. There are a few shive particles present, derived from knots which are fairly refractory. The pulp is considered to be not quite as high in quality as that from good quality straw, which has been carefully treated. The unbleached pulp would be far too expensive for wrapping paper, but there would be some prospects for the use of a proportion of same in covers and coloured papers. The presence of such a large quantity of moisture in the grass is objectionable; this would be reduced in amount by allowing the grass to further mature before cutting, but the knots would then become still more difficult to deal with. The yield of bleached pulp is not high, 1 ton pulp requiring about 3 tons 7 cwt. dry material, or 9½ tons moist grass. Taking the above into consideration, it is not thought that the prospects are at all promising for the use of this grass for pulping purposes.

QUEENSLAND AGRICULTURAL COLLEGE: DIPLOMA DAY, 1921.

June 10th was Diploma Day at the Queensland Agricultural College at Gatton, and, undeterred by torrential rain, a large and representative gathering, including visitors from various parts of Queensland and other States, assembled to witness the distribution of awards to successful students and to see something generally of College activities and, so far as the weather permitted, of dairy manufacturing and field operations.

The College was established in 1897 with three main objects: First, to provide sound training in the science and practice of agriculture, animal husbandry, and allied activities; second, to conduct experiments and investigations for the elucidation of agricultural problems; third, to establish stock studs from which pure-bred animals might be distributed at reasonable rates. All these objects have been achieved and continue in operation.

The College herds and flocks were paraded for the visitors' inspection, and everyone was struck by the uniformly high types of each particular breed. Later, a tour of inspection was made of the whole establishment, the general lay-out and equipment of which are strictly on the lines of economy and convenience.

PRESENTATION OF DIPLOMAS.

In the early afternoon the visitors, students, and their friends assembled in the College gymnasium, which had been prepared for the big event of the day—the presentation of diplomas. The Hon. W. N. Gillies, Minister for Agriculture, presided, and with him on the dais were Mr. Cuthbert Potts, B.A., Principal, and Mr. E. G. Scriven, Under Secretary.

The summarised points of the Principal's annual address were:—

The demand for agricultural education is growing, and its importance is being more widely recognised in our educational system right from the University down to Primary schools.

Of the ordinary students who have passed through the College, about 70 per cent. are now engaged in agriculture or allied industries.

A strenuous effort is being made to re-establish the College Old Boys' Union, which became moribund during the war.

The College Honour Roll lists the names of 200 ex-students and 35 members of the College staff.

The educational benefits of the College are not confined to students actually enrolled, and much important instruction is carried on by correspondence.

The number of visitors for the year was 1,020, the majority of whom were men who came for definite information on some branch of farming.

The College officers act as supervisors of practical field work as well as instructors.

There is a growing demand for the more general recognition of agriculture in the State educational system.

In the course of the year a move was made to establish an agricultural section in connection with the Lockyer High School at Gatton. This most important proposal came from the farmers of the Lockyer Valley. The design of the course is under consideration, and it is not expected to adversely affect the rural school movement. Agricultural education in connection with secondary schools will do much to check the cityward migration of country youth.

The Hon. W. N. Gillies affirmed that the science of agriculture is the most important subject on which the people of Queensland could engage thought. Other points of his address were:—

The experience of Great Britain during the war had driven home the importance of primary production.

Nature has been bountiful to Queensland in respect to rich and valuable soils and a generous climate that will respond in full measure to applied agricultural science. The possibilities of irrigation in the State are very great, and transport and methods of marketing claim equal attention. The Queensland Agricultural College is fulfilling a great purpose, and has an immensely beneficial influence on the State's development.

Mr. Gillies then presented the awards, congratulating each recipient on the honour he had attained. The successful students are:—

Diploma in Agriculture and Third Year Certificate in Agriculture.—J. A. Tait (Townsville).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—W. R. Straughan (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—A. W. McLuckie (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. S. Hall (Silverspur).

First Year Certificate in Agriculture.—A. Bray (Yorkshire).

First Year Certificate in Agriculture.—S. F. Murphy (Bowenville).

First Year Certificate in Agriculture.—K. M. Tait (Townsville).

First Year Certificate in Agriculture.—J. D. Land (Brisbane).

First Year Certificate in Agriculture.—T. Y. Bonar (Herberton).

First Year Certificate in Agriculture.—K. V. Henderson (Brisbane).

Diploma in Dairying, Second Year Certificate in Dairying.—W. B. Horneman (New Kareela, New South Wales).

Diploma in Dairying, Second Year Certificate in Dairying.—J. M. Irwin (Galala).

Diploma in Dairying, Second Year Certificate in Dairying.—N. A. Black (Neurum).

First Year Certificate in Dairying, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. V. Ward (Helidon).

Milk and Cream Testing Certificates.—B. T. Seymour (Biggenden), A. V. Clarkson (Brisbane), J. R. F. Zillman.

Third-class Engine-drivers' Certificate.—J. Pitceathly (Toowoomba), O. de Stokar (Dalby), R. V. Hodges (Calcutta, India).

COTTON SEED FOR SALE.

Dairymen who are hand feeding their milch cows and require a cheap and nutritious concentrate to add to the bulk foods used, have an excellent opportunity at the present time of purchasing cotton seed from the Department of Agriculture and Stock, William street, Brisbane, at £3 per ton at the Department, or £3 10s. per ton bagged on rails, Brisbane. *Remittance, with exchange added, should accompany order.*

The seed requires to be finely crushed before use.

Commercial cotton seed meal, prepared after the extraction of the principal part of the oil contained in the seed, is one of the richest and most valuable cattle foodstuffs. Its food value exceeds that of maize by 62 per cent., and wheat meal by 67 per cent.

An average analysis of cotton seed meal is as follows:—

	Per cent.
Water	7.80
Fat	9.31
* Protein (albuminoids, &c.)	42.00
Nitrogen free extract (carbohydrates, &c.)	28.83
Fibre	7.18
† ‡ Ash	5.88

Cotton seed, after reduction to the form of meal by passing it through a machine commonly used for crushing grain, is richer than cotton seed meal.

Ground cotton seed is used at the Agricultural College, Gatton, in quantities of from 1 to 3 lb. per cow per day, according to circumstances. Five pounds per day is to be regarded as a maximum amount for an animal in full milk.

Cotton seed prepared in this way is not attractive in appearance, owing to the short lengths of cotton lint present, these being found naturally adherent to the seed. As this is a vegetable fibre similar to other indigestible fibres found in vegetable matter commonly consumed by stock, it is not considered injurious to animals.

Cattle require a few days to become used to ground cotton seed, when mixed in their food, and should be gradually accustomed to the change of diet.

* Containing nitrogen = 6.72
† Containing phosphoric acid = 2.42.
‡ Containing potash = 1.95

Pastoral.

STOMACH WORMS (STRONGYLUS CONTORTUS).

By W. G. BROWN, Instructor in Sheep and Wool.

Last month a demonstration was given at Dalmally in respect to the experiments being carried out by the Special Blowfly Committee of the Institute of Science and Industry. Much information regarding sheep flies was given by the various speakers to a very representative gathering of Australian pastoralists. The writer seized the opportunity of issuing a warning on other pests; one especially, stomach worms, being almost as great a menace to the wellbeing of sheep in Queensland. In fact, it is a greater one, for there is sometimes respite from fly attack, but where the stomach worm is thoroughly established it is there all the time, and it is to be feared that the pest is now widespread in Queensland, not excluding the dry West. It is to be found on Peak Downs and Darling Downs, and in the Roma, Mitchell, and Charleville districts. Indeed, it is very difficult to say where it is not. The object of this article is to supplement a speech made at Dalmally, pointing out:—

(1) The danger to the wellbeing of Queensland flocks;
(2) The fallacy of the dry West not being favourable for the existence of the stomach worm;
(3) That the health of sheep governs to some extent blowfly infestation;
(4) Where to look for the parasite;
(5) The methods of combating the pest.

Like all introduced pests, little or no notice is taken at first of the spread of stomach worms. Sheep are doing well for a while and then for some unexplained reason they begin to fall off in a season when there is ample feed and water. They seem mopey and white faced, and, if driven hard, lie down. If driven further they probably die. There is no other disease in this, the healthiest stock country in Australia, so it is not hard to tell what ails the animals. They are wormy, and, being wormy, are infecting the whole country, for each female parasite lays from 1,500 to 2,000 eggs, and there are sometimes thousands of stomach worms in one animal. So the infestation of country is progressive. There is scarcely a district in Queensland where they cannot be found, though in many localities worms are comparatively few, and the sheep do not seem to suffer. Yet these few are the forerunners of many millions. Country is not naturally wormy. The pest must be introduced.

A fallacy many pastoralists cherish is that the dry West can never be the home of stomach worms. As a matter of fact they are strongly established there now, and every year sees an increase in their virulence. I have seen as bad a case as could be found on the Barcoo. Thanks to timely action on the part of the station-holder, however, they were soon exterminated on that particular holding.

There is no doubt that worm-infested sheep are more liable to fly attack than healthy sheep. Observation and experiment at Gindie State Farm and at Dalmally showed that conclusively. In fly infestation and also in worm infestation it is the weaners that suffer first and most. I know of a case where from 20 per cent. to 25 per cent. of the weaners died every year from worm attack. To-day the owner of that flock does not fear the pest, for he takes ample and timely measures against it, and his losses from that cause have now become negative. These measures I shall describe later.

HISTORY.

A short history of the life of *Strongylus contortus* as known to scientists informs us that the female lays eggs in the stomach of a sheep. These eggs pass out of the body in the excreta. They contain living embryos, which develop upon reaching moisture. The embryos moult three or four times after hatching, this process lasting from three days to four weeks according to the variation of humidity and warmth. The worms then climb the stalks of grass and await the coming of their host—a cud-chewing animal. The worms are swallowed with the grass. These, in the process of digestion, reach the fourth stomach, there again to copulate and lay eggs which pass out in the droppings, and the vicious circle is complete. It is known that the young worm is easily killed by cold or dryness, but when it is in the ensheathed or final form it may live for months until suitable conditions arise for its wellbeing. It is the ensheathed form which, endowed with length of life, matures in the stomach and produces eggs after intake by the sheep. It is in the fourth or true stomach where the parasite is found, and for the information of those who do not know where to look for the worms an illustration taken from "Sheep and its Cousins" (Lydekker) is reproduced. The worm itself is easily seen with the naked

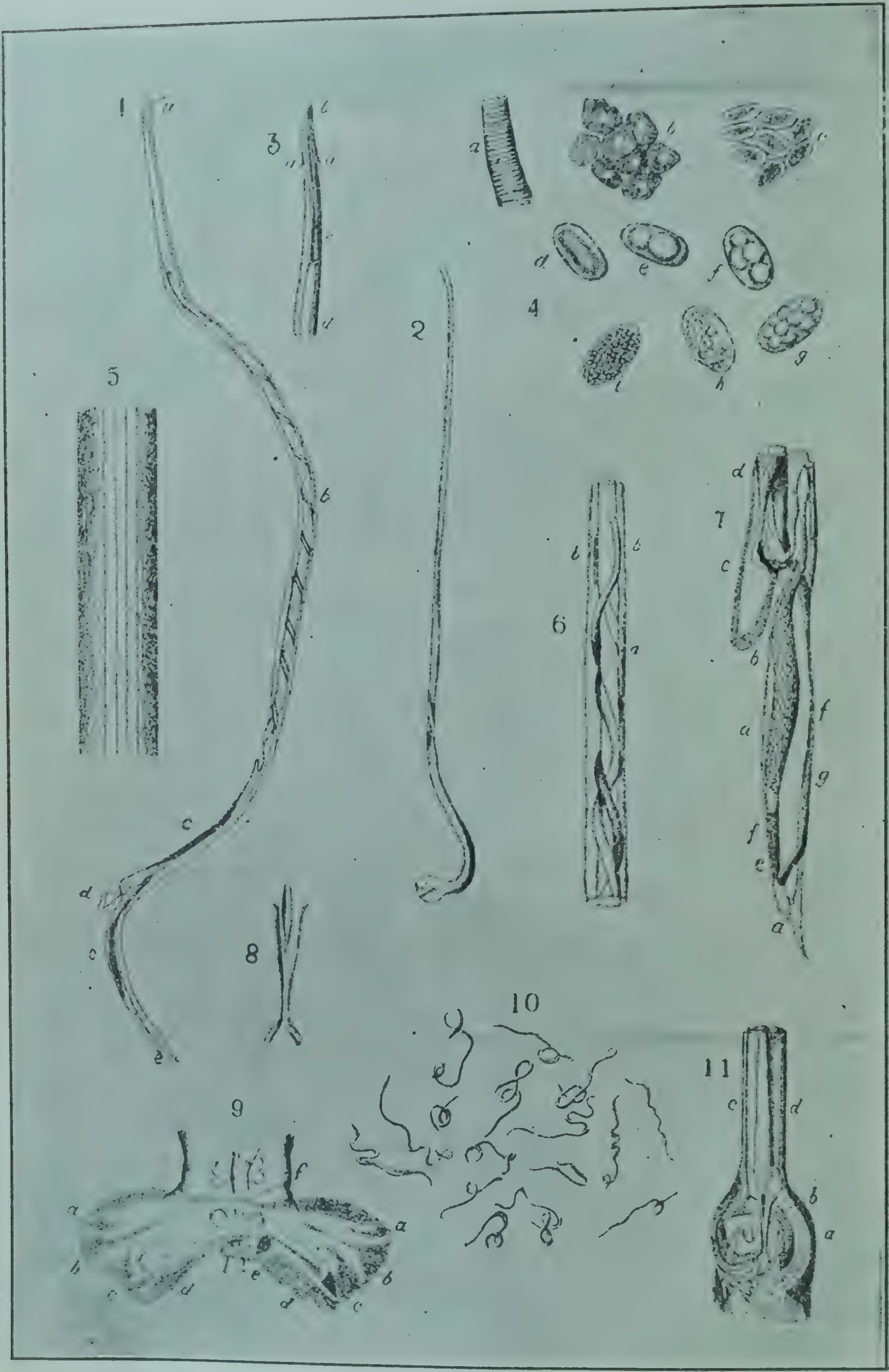
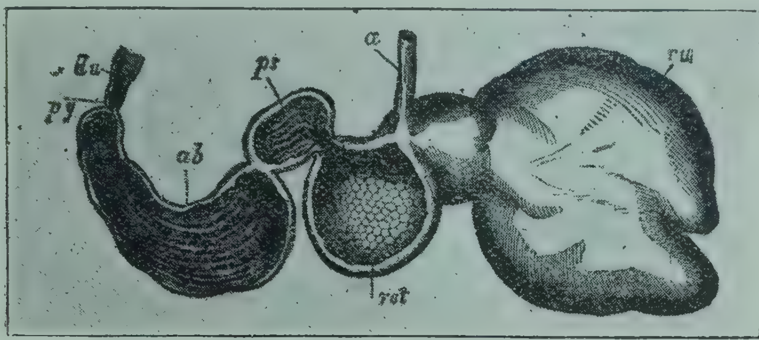


PLATE 1.—STRONGYLUS CONTORTUS. (The Twisted Stomach-worm.)

eye. The female is about 1 inch long, and presents the appearance of a barber's pole with its white and red spirals. The male is much smaller, and is plain red without spirals.



Stomach of a Sheep, partially cut open to show Internal Structure

œ, œsophagus, or gullet; *ru*, rumen, or paunch; *ret*, reticulum, or honeycomb; *ps*, psalterium, or manyplies; *ab*, abomasum; *py*, pylorus; *du*, duodenum, or commencement of the small intestine.

METHODS OF EXTERMINATION.

Two practicable means may be used to clear land of the pest. One is to burn off the grass, one paddock at a time, and ensure that sheep introduced after the burning off are thoroughly drenched. It is idle to clear a paddock of worms if it is immediately afterwards restocked with infested sheep.

The second way is to quarantine a paddock for twelve months. Then the worms will die out for want of a host. It is worth while using a rotation of paddocks to get rid of so serious a menace as stomach worms. It will take time, but horses may be grazed in a paddock which is being spelled.

Drenching is a simple matter. A long race such as the ordinary branding race is best. The operator stands at one end, when the race is filled, and, throwing his leg over the shoulder of the animal, he lifts the lip with the left hand and introduces the mouth of the horn or bottle between the nippers and grinders of the animal, and, putting the horn or bottle well over the back of the tongue, he lets the liquid flow gently until the dose is swallowed. Sheep should be drenched on four legs, and the head kept nearly level during administration. It is all the better if the drench is warm, say, at blood temperature. The drench which I have found successful in the course of many years' experience is cheap and good, if proper care be taken in mixing. It is made up as follows:—

Arsenic (white)	2 oz.
Epsom salts	6 lb.
Water	5 gallons.

Boil 3 gallons of water in a 5-gallon drum, and when the water is boiling add the arsenic and salts. Boil for forty-five minutes, stirring occasionally. Then add cold water to make 5 gallons. The drench is then ready for immediate use. The doses are as follow:—

For grown sheep	2 fluid ounces
For hoggets	1½ fluid ounces
For lambs over 4 months	1 fluid ounce.

Sheep should be yarded for from fifteen to twenty-four hours before drenching, and should not be allowed to drink for four hours after.

A second drenching may be given in from seven to ten days. The arsenic used is really a tonic and cannot hurt the sheep if properly mixed, boiled, and administered.

DESCRIPTION OF PLATE.

STRONGYLUS CONTORTUS.

FIG. 1.—Adult female magnified six times: *a*, head; *b*, ovaries wound around intestines; *d*, papillæ.

FIG. 2.—Adult male magnified six times.

FIG. 3.—Head: *a*, two-barbed papillæ.

FIG. 4.—Eggs highly magnified: *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, different stages of development; *i*, egg as it is laid.

FIG. 5.—Skin showing nine of eighteen longitudinal lines.

FIG. 6.—Portion of female: *a*, intestines; *b*, *b*, end of ovary.

FIG. 7.—Caudal end of female: *a*, vulva; *b*, *c*, vagina; *d*, *d*, uteri filled with eggs; *e*, oviduct; *f*, *f*, ovary; *g*, intestines.

FIG. 8.—Spicula, enlarged.

FIG. 9.—Bursa expanded to show costæ.

FIG. 10.—Group of males and females; natural size.

FIG. 11.—Caudal end of male: *a*, bursa; *b*, spicula; *c*, seminal reservoir; *d*, intestine.

WOOL.

BY ALEX. WYNNE, Assistant Instructor in Sheep and Wool.

HISTORICAL SKETCH.

Notes on Australian sheep and wool would be incomplete without reference to the pioneers of one of our greatest rural industries. To Captain Waterhouse is due much of the credit for the laying of the foundation of the Australian wool business. It was he who purchased thirty-two Spanish Merino sheep from a Mrs. Gordon, of Cape Colony. He succeeded in landing twenty-nine at Sydney, where their arrival created great interest; and Captain Macarthur was so impressed with them that he offered their importer fifteen guineas a head for the lot, but only succeeded in obtaining three rams and five ewes, the remainder being distributed among other settlers. Captain Macarthur's little flock formed the nucleus of a merino-breeding establishment that was to prove of the utmost importance to Australia. As his small flock increased, Macarthur noticed that the sheep improved in fleece and frame, and the pastoral possibilities of Australia so impressed him that, it is reported, he endeavoured to float a company with a capital of £20,000 in England for the purpose of developing the sheep and wool industry in the new colony. In this, however, he was unsuccessful, but, undeterred in his object of firmly establishing the industry, he purchased more merinos from the flock of King George III. Wool subsequently grown by Captain Macarthur was sold in London at 6s. per lb. The Yorkshire spinners were attracted by its manufacturing qualities, and eagerly sought it. Part of the building in which Australian wool was first milled near Bradford is, I noticed while recently in England, still standing. The Rev. Samuel Marsden was another who saw the great future of woolgrowing in Australia, and followed with success the lead set by Captain Macarthur.

It is interesting to observe that the foundation flock of our great sheep industry came from South Africa, and to-day South African breeders are now eagerly looking to Australia to supply stock for their own flock improvement.

FORMATION OF GROWTH OF WOOL FIBRE.

By way of illustration I have had reproduced four drawings (see plate) from F. H. Bowman's work "Structure of the Wool Fibre," and a photograph of a Corriedale wool staple plainly showing its character. Figure 1 shows the genesis of the fibre in a minute bag or sack known as the hair follicle. This follicle contains a plastic fluid which provides the cells that go to make up the fibre. The hair follicle is continuously fed with the fluid, the quantity of which is governed by the health and condition of the animal. Immature or defective cells naturally affect the strength of the fibre. It will be noticed that two glands are attached to the fibre; those are the Sebiparous glands which supply to the fibre the fatty substance known as yolk. This is a natural lubricant, and also supports the growing fleece. Its components are oil, lime, and potash. Other glands, Sudoriparous, drain the skin

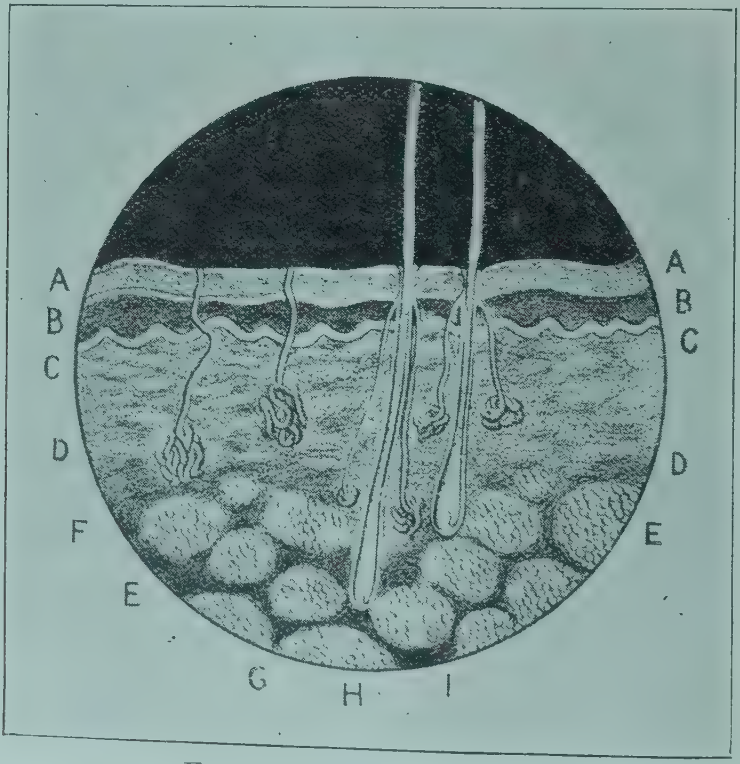


FIG. 1.—SECTION OF SKIN.

of swint or sweat which is conveyed to the surface of the pelt, where it intermixes with the yolk in the fibre. Swint is composed principally of potash salts, a valuable by-product of scouring.

In the composition of the fibre are the Medulla cells which are located in the centre and form the Medullary canal. A longitudinal section of a hair fibre (Fig. 2)

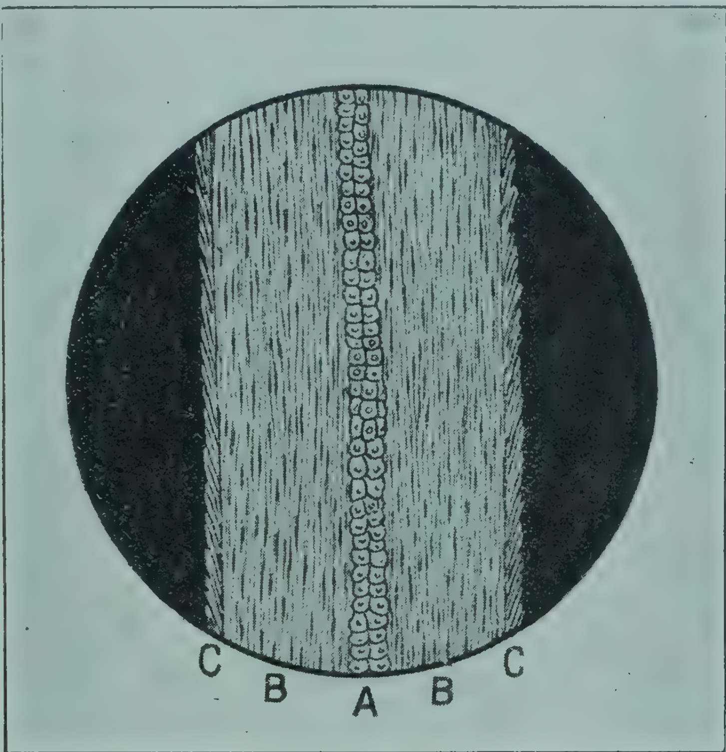


FIG. 2.—LONGITUDINAL SECTION OF HAIR.

shows this canal more plainly. Around the Medulla cells are two other sets of cells (see transection in Fig. 3). In addition are the outer Medullian cells (Fig. 4). The construction of cells in this minute hair follicle continues during the life of the

FIG. 3.—TRANSVERSE SECTION OF WOOL FIBRE.

sheep. These crowd out their predecessors in the form of a fibre on the surface of the skin. This crowding or pushing causes the crimps in the staple. The smaller the cell the greater the crimp. This action flattens the Medullian cells against the fibre (see Fig. 4) and is invisible to the naked eye.

As growers and others often confuse the two terms, crimps and serrations, I propose to define both, illustrating them by photograph (Fig. 5).

Crimps are the waves or undulations of the fibre.

Serrations are the pointed scaly coverings of the fibre caused by the flattening of the Medullian cells, which overlap from the base to the tip of the fibre and are invisible to unaided sight. These may be felt with a sensitive touch. By gently rubbing one's fingers from a staple tip to its base the edges will be felt to slightly grip; but if the finger movement is in the opposite direction, no grip will be sensed.

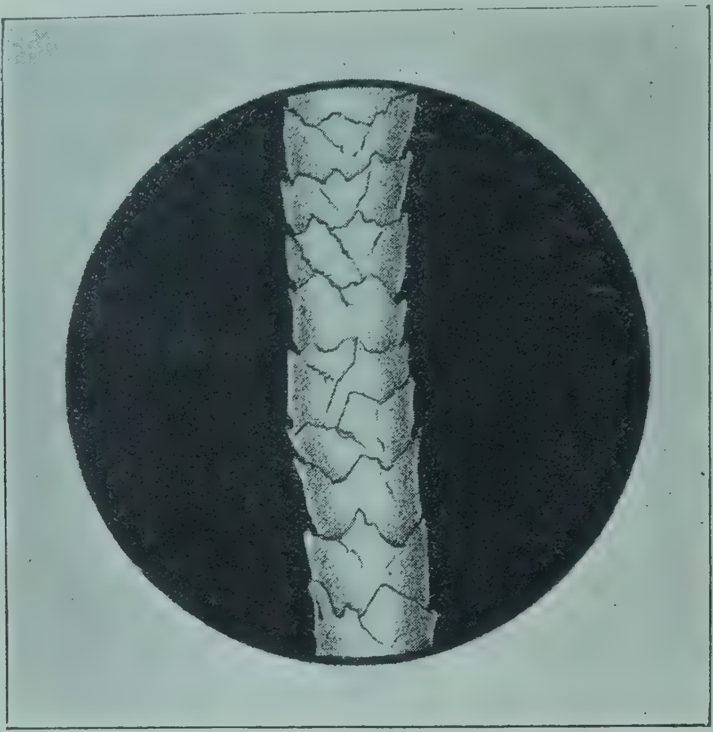


FIG. 4.—TYPICAL WOOL FIBRE.

It is obvious that, in order to get the best results, it is necessary for the wool-grower to bestow as much time and attention as possible to the welfare of his flock.

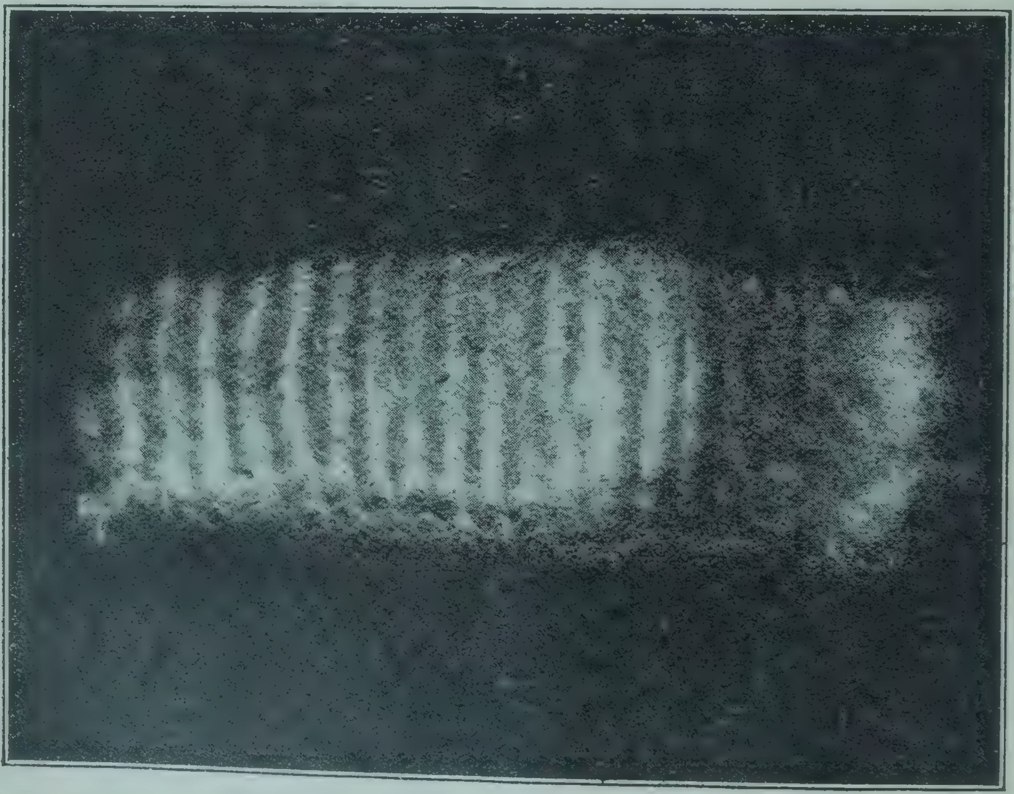


FIG. 5.—CRIMPS AND SERRATIONS.

BREEDS AND TYPES.

Every breed has its varying types; the same applies to covering. On this continent, with its diverse climatic conditions, no hard-and-fast rule can be laid down as to what breed or type is most suitable for a beginner in the pastoral industry.

The Merino we will discuss first. There are several factors that weigh in the decision as to the best type or variety of wool to grow, but it must be borne in mind that fine wool grows on a thin skin, and strong wool grows on a thick skin. Fine-woolled sheep, therefore, requires more beneficent conditions. For instance, in South-western Queensland, where the climatic conditions are sometimes severe, only an inexperienced grower would attempt to produce a fine-woolled animal. A medium to a strong fleeced sheep would, in that area, be more certain to fill the bales of the careful grower. The suitability of any locality for a particular type can be determined by local knowledge. A selector with limited experience would be ill-advised to attempt to breed his own rams. By doing so he would risk the propagation of nondescript and characterless types. Initial mistakes in this respect would take years of careful selection and breeding to correct. A better and more profitable course in the long run would be to secure rams of the type required from a reputable flock master.

WOOL *VERSUS* COTTON.

The old idea that wool is essentially the clothing of the West, while cotton is the clothing of the East, is undergoing revision. The Eastern peoples are demanding wool in greater quantity every year. The hygienic hydroscopic value of wool, *i.e.*, its more-ready absorption and retention of moisture, is being recognised more widely in Eastern countries, and its comfort as compared to cotton commends itself to inhabitants of tropical and sub-tropical countries. Its hydroscopic capacity is 18.4 per cent., compared to the 8.5 per cent. capacity of cotton. Where Eastern peoples formerly used very little wool they now import a big proportion of the Australian clip, and recent auction sales demonstrated the strength of Japan as a competitor for our best classes. From this trade development is drawn an obvious moral, and the necessity of maintaining and, if possible, improving our present high standards in sheep and wool production becomes apparent.

REPUTED POISONING OF SHEEP BY BUTTON GRASS.

In a letter from Barcarolle, Jundah, dated 9th May, 1921, Mr. F. L. Berney writes:—

"I have just lost a few sheep from their eating what at most times is the best of feed, and of this I am sending you two samples on the chance that you may consider an analysis worth while. The two plants sent are button grass and pig weed, both very common things, and the circumstances of the poisoning are as follows:—

> A small lot of sheep were yarded in a yard that had not been used for some months, and in which there was a dense and luxurious growth of the two above-mentioned plants—90 per cent. button grass and 10 per cent. pig weed; practically nothing else. They were left in all night, and the following day some of them showed symptoms of poisoning, staggered when they walked, and fell over. Half a dozen recovered during the following night, but two or three died.

"From a pamphlet on this subject I learn that of two lots of a plant under investigation one lot grown on highly fertilised soil developed a considerable amount of poison, while another lot grown on poor land showed little or no traces of it. The sheep yard that has been in use for some years would naturally become very rich from the accumulation of sheep manure."

Mr. C. T. White, F.L.S., Government Botanist, replies as follows:—

"The specimens when they reached me were too far advanced for a test to be satisfactorily carried out for the presence of a cyanophoric (prussic-acid-yielding glucoside). However, Dr. J. M. Petrie, the well-known investigator of Australian poisonous plants, in a list of tests made on Australian grasses, and published in Volume 38 of the Proceedings of the Linnean Society of New South Wales, has reported the fact that our common button grass (*Eleusine ægyptiaca*) is strongly cyanophoric at all times of the year, with the exception of the mid and late winter months.

"The note sent by Mr. Berney, however, is the first instance that has come under my notice where this grass has been definitely blamed as the cause of losses among stock in Queensland, and notes from the pastoralists on the subject would be welcomed."

The Horse.

CERTIFICATES OF SOUNDNESS.

Subjoined is a list of stallions registered and certified as sound, in the course of the month of May:—

Name of Horse.	Owner's Name and Address.
DRAUGHTS.	
Bute Baron (L)	J. W. Lowis, Waghorn st., Ipswich.
Royal Mac (L)	G. Myers, Kircubbin, Maryborough.
Prince (L)	J. Burgess, Bororen.
Saxon (L)	F. Hickman, Uplands, Bororen.
Operator (L)	G. Elliot, Laidley South.
King Boro'	J. A. Horrobin, Silver Dale, Tingoora.
BLOODS.	
Scottish King (L)	J. J. Little, Toogoolawah.
Firerack (L)	D. Vogel, Milbong.
Royal Form	T. Tuite, Toogoolawah.
LIGHT HORSES.	
Master Hall (L)	J. Baird, Toogoolawah.
Raporer (L)	W. J. Salmon, Harrisville.
PONIES.	
Master Badger II. (L)	W. A. Herrmann, Toogoolawah.
Cymro (L)	O. Davitt, Queen st., Newtown, Ipswich.
Pinto Ben (L)	W. Butcher, Oakhurst, Maryborough.
King Rufus	J. G. Reiser, Maroon, Boonah.

A RECIPE FOR BLACK WAX.

A South Burnett correspondent writes:—"The Farmers' Handbook of New South Wales," 3rd edition, contains a simpler recipe for making "Black Wax" than the one given in answer to a correspondent in the May Journal. Whether it is as good I cannot say, but I forward a copy for what it is worth. For "White thread," beeswax alone is used. For "Black thread," the mixture is 1 lb. pitch to 4 oz. of resin. The pitch and resin are heated until thoroughly liquified and intermingled, when the composition is poured into cold water in which it can be conveniently preserved.

When required for use, a piece about as big as the top of the thumb is cut off with a wet knife, and held while being used in a piece of soft leather to prevent it sticking to the fingers. These proportions of pitch and resin make a suitable wax for warm weather, but in winter it becomes hard and brittle. This can be overcome by making a mixture of the following:—1 lb. pitch, 3 oz. resin, 3 oz. mutton fat. The thread sometimes becomes hard and sticky when cold and will not run well. This can be remedied by smearing the fingers with raw beef or mutton fat, passing them up and down the thread a few times.

Dairying.

FRUITY FLAVOURS IN MILK AND CHEESE.

BY R. SNELL, Instructor in Cheese Making.

(An epitome of a Paper read before the Annual Conference of the Queensland Butter and Cheese Factory Managers' Association.)

DESCRIPTION.

Fruity flavours take their name from the peculiar odours they emit, that of certain ripe fruits, such as pineapple and strawberry, and not from the flavour they leave on the palate. To the palate they are sweet, sickly flavours, and are by no means pleasant. They are very hard to detect by taste or smell in the milk as delivered to a cheese factory, and seldom make their presence known until the cheese-making process is well advanced. As the cheese matures they develop into a very strong unpleasant smell and taste.

CAUSES.

Like many other defective flavours in cheese, fruity flavours are bacterial. Specific bacteria gain access to the milk from outside sources. They are not, as many suppose, transmitted to the milk through the system of the cow, but are carried into the milk through the medium of dust and dirt.

SOURCE OF CONTAMINATION.

Fruity flavours are closely associated with other undesirable flavours in milk and cheese, and a most prolific source of contamination is an organism known as Bacillus Coli Communis. The natural habitat of this organism is the intestines of all animals. Hence it becomes apparent that milk may be quickly and badly contaminated by the dust and dirt of the cow yard, dust falling into the milk pail from the flanks and udders of cows, and milking with unwashed hands. Another source of contamination not known to every producer of milk are the first few streams drawn from the cow's udder. This milk is known to contain bacteria, which gain access thereto through the small duct at the end of the teats. This first milk contains very little fat, and is not of very great monetary value to the dairyman, and therefore should be rejected. Vitiated atmosphere is undoubtedly another cause of contamination with fruity flavours.

I strongly advocate aeration, especially when cows are fed on strongly flavoured food. Aeration of milk should be thoroughly carried out both morning and evening. Aeration, however, will defeat its own object if not carried out properly. In the light of the foregoing as to sources of contamination, it is at once apparent that to aerate milk in the atmosphere of the cow yard, or in an atmosphere that has just previously passed over the cow yard, hog pen, fowl yard, or other odorous places, would be to invite contamination of what is otherwise pure milk. Milk should be thoroughly strained. I regret to say I have seen dairymen, who otherwise take very great care, devalue their product by the use of some unsuitable strainer. The practice of using a piece of cheese or other cloth is open to the severest condemnation, as is also the use of a strainer that cannot be dissembled for the purpose of cleansing. I have seen cloth strainers, even in otherwise clean dairies, so soiled as to spoil the best of milk. Yet another source of contamination of milk with fruity flavours is a dirty whey tank. Failure to empty and thoroughly cleanse and scald cans, foul factory drains, and lactic starters cannot be too strongly condemned.

PREVENTION.

Rules to observe for the prevention of fruity flavour are very clear. (1) Udders and flanks of cows should be freed as much as possible from dust and dirt, and the teats washed in clean water prior to milking. (2) Milkers should wash their hands after milking each cow. (3) Milk should be removed as soon as possible to a clean dairy house, and thoroughly aerated in a pure atmosphere. (4) The first few streams of milk from each teat should not be retained. (5) Strainers of cloth or strainers so constructed as not to admit of thorough cleansing, should not be used.

REMEDY.

The flavours should not be in the milk, and the remedy is in the hands of the dairyman. When the cheese maker suspects fruity flavours in his milk, he should use a good clean lactic starter. He should set the milk at such an acidity as to allow of the curd being well firmed before drawing the whey. If this is not possible he must use a fairly high cooking temperature. Develop a little more acidity than ordinarily before drawing the whey. Aerate the curd well after milling. The use of a little more salt than ordinarily is recommended, especially on curds that are inclined to be soft.

QUEENSLAND BUTTER AND CHEESE MANAGERS' ASSOCIATION.

ANNUAL CONFERENCE.

The members of the Queensland Butter and Cheese Managers' Association met in conference in Brisbane on 15th and 16th June. In the course of the proceedings many matters of importance bearing on two of the chief industries of the State were discussed.

Combined with the conference was an exhibition and competition in dairy products; thirty-five factories were represented. Mr. W. F. Uhlmann presided.

Dual Grading.—The conference viewed the existing system of dual grading with disfavour, and was of opinion that State control would prove more satisfactory than Federal control.

ADDRESSES.

Fruity Flavours in Cheese.—Mr. R. Snell, Instructor in Cheesemaking, Department of Agriculture and Stock, read a paper on the subject of "Fruity Flavours in Cheese," an abridgment of which appears elsewhere.

Mr. E. Graham, Chief Dairy Expert, outlined the new Dairy Act and Regulations which deal with every activity of the dairying industry and are in keeping with the general progress of the industry in recent years. The main points of his address were—

The new Act provides for returns from factories showing particulars of the quality of their products, and seeks to secure co-operation towards a general improvement of quality. The Act provides also for new powers in respect to insistence upon the cooling of milk intended for cheesemaking on farms, for special attention being given to cream subject to infrequent delivery, and for pasteurisation or aeration when considered necessary. When first and second grade products are received at the factory provision is made for separate receptacles for each grade.

Hon. W. N. Gillies, Minister for Agriculture, addressed the conference on various phases of the industry, and illustrated its importance with the following statistics:—Quantity of butter graded for export, 33,615,848 lb., value, £4,096,924. Butter consumed locally in Queensland, 16,016,000 lb. (approximate); value, £1,623,024. Total production of butter, 49,631,848 lb.; value, £5,719,948.

Quantity of cheese graded for export, 7,068,334 lb.; value, £382,868. Cheese consumed locally in Queensland, 2,000,000 lb. (approximate); value, £108,333. Total production of cheese, 9,068,334 lb. Value, £491,201.

Total value of butter and cheese manufactured for export and local consumption, £6,211,149.

Mr. M. A. O'Callaghan (Commonwealth Dairy Expert) remarked upon the present position of Australia in the butter world, and stressed the importance of continuing to market first quality product.

Mr. M. Wallace (Chief Commonwealth Grader) dealt with the manufacture and grading of cheese for export, and in the course of his remarks made the following points:—

The cheese now marketed on the other side of the world is not similar in quality to that sold locally. In order to manufacture a cheese which would have many of the characteristics of the Cheddar—one that would be palatable when a few months old—it is necessary that it should be made firmer than the cheese sold to local consumers. The sooner cheese goes into cold storage after it becomes dry the better.

The British grocer demands large cheeses about 70 or 80 lb. in weight. Cheese for export should be bright in colour, but not too much so. He favoured a cheese equal in breadth and height. Ninety per cent. of the low yield in summer may be attributed to over acidity. Uniformity in package and marking is essential. Faults in grading include faults in flavour headed by tainted and fruity flavours. Pasteurisation of whey and clean tanks assists in the avoidance of tainted flavours. The only remedy for fruity flavour rests in hygienic handling and the better cooking of the product.

THE EXHIBITION.

POINTS AWARDED.

The points awarded at the exhibition of dairy products held in conjunction with the conference are listed as under. The maximum number of points obtainable in each butter class was 100, proportioned as follows:—Flavour, 65; texture, 20; colour, 7; salting, 4; packing and finish, 4. In cheese the maximum number comprised:—Flavour, 50; texture, 25; colour and fiinsh, 25. The exhibits were judged by Mr. E. Graham, Chief Dairy Expert.

BUTTER.

——	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
CLASS NO. 1—EIGHT WEEKS STORAGE. *Salted, Packed for Export.*						
Downs Co-operative Dairy Co., Ltd., Toowoomba	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Dairy Co., Ltd., Boonah	58½	20	7	4	4	93½
Maryborough Co-operative Dairy Co., Ltd., Maryborough	54½	19½	7	4	4	88½
Caboolture Co-operative Co., Ltd., Caboolture	54	19	7	3½	3½	87
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	7	4	3	90½
Queensland Farmers' Co-operative Co., Ltd., Grantham	55	19½	7	4	4	89½
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19½	7	4	4	86½
Gayndah Co-operative Dairy Co., Ltd. ..	55	19½	7	3	4	88½
Oakey District Co-operative Butter Co., Ltd.	59	20	7	4	4	94
Queensland Farmers' Co-operative Co., Ltd., Booval	58½	19½	7	3½	3½	92
Warwick Butter and Dairy Co., Ltd., Mill Hill	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	3½	3½	89½
Caboolture Co-operative Co., Ltd., Pomona ..	53½	19½	7	3½	3½	87
Queensland Farmers' Co-operative Co., Ltd., Laidley	57	19½	7	3½	3½	90½
Downs Co-operative Dairy Co., Ltd., Crow's Nest	52½	19	7	3	3	84½
Warwick Butter and Dairy Co., Ltd., Texas	57	19	7	4	3	90
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	56½	19	7	4	3	89½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56½	19	7	4	3½	90
CLASS NO. 2—THIRTY DAYS STORED. *Salted, Packed for Export.*						
Warwick Butter and Dairy Co., Ltd., Texas ..	57	19	7	4	3	90
Caboolture Co-operative Co., Ltd., Pomona ..	56	19	7	4	3	89
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	57	19	7	4	3	90
Downs Co-operative Dairy Co., Ltd., Brook St.	59	19½	7	4	3	92½
Gayndah Co-operative Dairy Co., Ltd. ..	58	19½	7	4	3	91½
Queensland Farmers' Co-operative Co., Ltd., Laidley	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	4	3	89½
Oakey District Co-operative Butter Co. ..	55	19½	7	4	3	88½
Queensland Farmers' Co-operative Co., Ltd., Boonah	58½	20	7	4	4	93½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56	19½	7	4	3½	90
Maryborough Co-operative Dairy Co., Ltd., Maryborough	55	19	7	4	3½	88½
Queensland Farmers' Co-operative Co., Ltd., Grantham	57½	19½	7	4	4	92
Caboolture Co-operative Co., Ltd., Caboolture	53	19	7	3½	3½	86
Downs Co-operative Dairy Co., Ltd., Brook St.	56	19	7	3½	3½	89
Queensland Farmers' Co-operative Co., Ltd., Booval	57	19	7	3	3½	89½
Warwick Butter and Dairy Co., Ltd., Mill Hill	55	19	7	4	3	88
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19	7	4	3	85
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	6½	4	3	90

BUTTER—*continued.*

CLASS NO. 3—FRESH BUTTER.

Salted.

——	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Caboolture Co-operative Co., Pomona ..	57½	19	7	4	3	90½
Queensland Farmers', Boonah	59	20	7	4	4	94
Warwick Butter and Dairy Co., Mill Hill ..	57	19½	7	4	3	90½
Maryborough Co-operative Dairy Co., Kingaroy	58	19½	7	4	3	91½
Caboolture Co-operative Co., Caboolture ..	57½	19½	7	3	3	90
Warwick Butter and Dairy Co., Allora ..	57½	19½	7	3½	3	90½
Maryborough Co-operative Dairy Co., Maryborough	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Brook St. ..	57	19½	7	4	3½	91
Caboolture Co-operative Co., Eumundi ..	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Dalby ..	57	19½	7	4	3½	91
Queensland Farmers,' Grantham	58½	20	7	4	4	93½
Oakey District Co-operative	59½	20	7	4	4	94½
Downs Co-operative Dairy Co., Clifton ..	58	19½	7	4	3½	92
Queensland Farmers', Laidley	59	19	7	4	4	93
Downs Co-operative Dairy Co., Brook St. ..	58½	19	7	3½	3½	91½
Gayndah Co-operative Dairy Co.	58	20	7	4	3½	92½
Queensland Farmers,' Booval	57	19½	7	4	4	91½

CHEESE.

——	Flavour.	Texture.	Colour and Finish.	Total.
CLASS NO. 4.				
Two Export Cheese, Coloured, not less than 60 lb.				
Kooroongarra Co-operative Dairy Co.	43	30	19	92
Merrimac Co-operative Cheese Co., Ltd.	44	30	20	94
Downs Co-operative Dairy Co., Gowrie Junction	41	29	18	88
Downs Co-operative Dairy Co., " Unity," Westbrook	41	30	19	90
Downs Co-operative Dairy Co., " Unity," Jondaryan	39	29	19½	87½
Downs Co-operative Dairy Co., " Unity," Koondai	38	29	20	87
Downs Co-operative Dairy Co., " Unity," Hodgson Vale	44	30	19	93
Warwick Butter and Dairy Co., Ltd., Victoria Hill	42	30	19½	91½
Warwick Buttr and Dairy Co., Ltd., Bony Mountain	41½	29½	18½	89½
Warwick Butter and Dairy Co., Ltd., Talgai	40	30	20	90
CLASS NO. 5.				
Two Medium Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Talgai	40	30	19½	92½
Kooroongarra Co-operative Dairy Co., ...	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42½	29	19	90½
Pittsworth Dairy Co., Ltd., Brookstead	41½	30	20	91½
Warwick Butter and Dairy Co., Ltd., Bony Mountain	39	30	19	88
Downs Co-operative Dairy Co., Ltd., Jondaryan	40	29	19	88
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41½	30	19½	91
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91
CLASS NO. 6.				
Two Medium Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Talgai	40	30	20	90
Warwick Butter and Dairy Co., Bony Mountain	40	39	19	88
Downs Co-operative Dairy Co., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Jondaryan	41	30	19	90
Downs Co-operative Dairy Co., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Westbrook	43	30	20	93
CLASS NO. 7.				
Two Loaf Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	40	29	19½	88½
Kooroongarra Co-operative Dairy Co.	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42	29	19	90
Warwick Butter and Dairy Co., Ltd., Talgai	38	29½	19½	87
Pittsworth Dairy Co., Ltd., Brookstead	41	30	19½	90
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41	30	20	91½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Jondaryan	38	39	19	86
Downs Co-operative Dairy Co., Ltd., Westbrook	42	30	20	92

CHEESE—*continued.*

—	Flavour.	Texture.	Colour and Finish.	Total.
CLASS NO. 8.				
Two Loaf Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	38	30	19½	86½
Warwick Butter and Dairy Co., Ltd., Talgai	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Jondaryan	38½	29	19½	87
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91

The Awards were as follow :—

BUTTER.

CLASS NO. 1.—
- Oakey District Co-operative Co., Ltd. 1
- Queensland Farmers' Co-operative Dairy Co., Boonah 2
- Warwick Butter and Dairy Co., Ltd., Mill Hill 3

CLASS NO. 2.—
- Queensland Farmers' Co-operative Co., Ltd., Boonah 1
- Queensland Farmers' Co-operative Co., Laidley 2
- Downs Co-operative Dairy Co., Ltd., Brook St. 3

CLASS NO. 3.—
- Oakey District Co-operative Co., Ltd. 1
- Queensland Farmers' Co-operative Co., Boonah 2
- Queensland Farmers' Co-operative Co., Grantham 3

CHEESE.

CLASS NO. 4.—
- Merrimac Co-operative Cheese Coy., Ltd. 1
- Downs Co-operative Dairy Co. " Unity," Hodgson Vale 2
- Kooroongarra Dairy Co-operative Co. 3

CLASS NO. 5.—
- Warwick Butter and Dairy Co., Talgai 1
- Downs Co-operative Dairy Co., Hodgson Vale 2
- Pittsworth Dairy Co., Brookstead 3

CLASS NO. 6.—
- Downs Co-operative Dairy Co., Westbrook 1

CLASS NO. 7.—
- Downs Co-operative Dairy Co., Hodgson Vale 1

CLASS NO. 8.—
- Warwick Butter and Dairy Co., Talgai 1

STRAWBERRY STALKING DEVICE.

Mr. H. G. Eckhardt, a strawberry grower, of Cleveland West, has patented a very ingenious device for cleanly picking strawberries. The main principle of the device is a steel cutter with V-shaped jaws. It makes a clean cut of the calyx from the fruit. After the berry is cut it drops on to a minute wire grid, through which drops all dirt and grit, and the berry passes cleanly into the picking tray or tin. The device is very simple, and is sure to become a useful and hygienic addition to the strawberry-grower's outfit.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MAY, 1921.

The laying in the group sections was excellent throughout the month. In the light group section only five pens out of the eighteen failed to pass the 100 mark, and five out of the twelve heavy group pens failed to secure the 100. The singles in most cases have been very choppy. Several times during the month they appeared to have settled down to work, but a couple of days of westerlies with cold nights put a number off the lay for several days. The health of the birds is excellent. The highest individual score was made by R. Burns's "F" bird with 29 eggs in thirty-one days. W. Becker's White Leghorn in "E" pen laid 27 for the month. The following are the individual records:—

Competitors.	Breed.	May.	Total.
	LIGHT BREEDS.		
R. Gill	White Leghorns	139	254
H. C. Thomas	Do.	133	245
F. Birchall	Do.	126	233
*G. Trapp	Do.	108	233
W. A. Watson	Do.	127	222
*W. and G. W. Hindes	Do.	92	215
R. C. Cole	Do.	105	204
*J. Newton	Do.	108	202
Oakleigh Poultry Farm	Do.	131	201
*C. M. Pickering	Do.	111	199
*Mrs. R. Hodge	Do.	93	197
*H. C. Towers	Do.	112	195
O. C. Goos	Do.	118	191
*H. Fraser	Do.	115	190
*J. M. Manson	Do.	116	190
*R. C. J. Turner	Do.	95	186
J. W. Short	Do.	106	175
Miss E. White	Do.	111	172
*C. Goos	Do.	88	172
*W. Becker	Do.	89	166
M. F. Newberry	Do.	103	162
E. Stephenson	Do.	102	158
*E. Chester	Do.	73	157
W. Barron	Do.	89	154

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	May.	Total.
LIGHT BREEDS—*continued.*			
Bathurst Poultry Farm	Do.	105	153
*Haden Poultry Farm	Do.	67	151
*T. Eyre	Do.	74	150
*T. Fanning	Do.	70	149
*Thos. Taylor	Do.	82	149
*W. and G. W. Hindes	Brown Leghorns	88	149
*E. A. Smith	White Leghorns ...	79	143
*Mrs. L. Anderson	Do.	97	142
*S. L. Grenier	Do.	86	139
*B. Chester	Do.	80	137
Mrs. E. Z. Cutcliffe	Do.	82	134
*G. Williams	Do.	82	132
H. Stacey	Do.	101	118
Brampton Poultry Farm	Do.	35	104
W. N. Glover	Do.	59	94
Linquenda Poultry Farm	Do.	72	91
*H. P. Clarke	Do.	45	65
HEAVY BREEDS.			
Jas. Potter	Black Orpingtons ...	152	270
T. Fanning	Do.	129	259
Jas. Avery	Langshans	117	220
*J. Ferguson	Chinese Langshans ...	144	216
*A. E. Walters	Black Orpingtons ...	124	207
*T. Hindley	Do.	104	203
Jas. Ryan	Rhode Island Reds ...	125	201
Rev. A. McAllister	Black Orpingtons ...	109	196
G. Muir	Do.	120	196
*E. Morris	Do.	73	175
W. Becker	Langshans	63	169
*R. Holmes	Black Orpingtons ...	66	168
*C. C. Dennis	Do.	117	164
*E. Stephenson	Do.	83	163
*Parisian Poultry Farm	Do.	76	159
*R. Burns	Do.	83	157
*E. F. Dennis	Do.	91	153
*H. M. Chaille	Do.	63	148
*J. A. Cornwell	Do.	105	140
G. Cumming	Do.	72	128
J. W. Newton	Do.	80	105
*Mrs. G. Kettle	Do.	66	94
*A. Shanks	Do.	65	85
*J. E. Smith	Do.	48	65
*E. Oakes	Do.	31	62
*N. A. Singer	Do.	38	57
F. Harrington	Rhode Island Reds ...	31	37
Tom C. Hart	Black Orpingtons ...	24	32
Total	...	6,293	11,102

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	41	30	36	43	44	39	233
W. and G. W. Hindes	45	21	39	46	45	19	215
J. Newton	33	40	39	22	40	28	202
C. M. Pickering	42	34	31	25	42	25	199
Mrs. R. Hodge	31	42	36	33	41	14	197
H. C. Towers	36	29	32	25	34	39	195
H. Fraser	41	27	32	22	38	30	190
J. M. Manson	26	41	35	24	39	25	190
R. C. J. Turner	31	24	29	30	32	40	186
C. Goos	27	43	8	19	24	51	172
W. Becker	19	35	34	24	45	9	166
E. Chester	23	37	23	24	25	25	157
Haden Poultry Farm	23	30	17	25	18	38	151
T. Eyre	25	15	22	32	34	22	150
T. Fanning	29	20	31	24	17	28	149
Thos. Taylor	30	34	20	10	18	37	149
W. and G. W. Hindes	16	14	22	39	27	31	149
E. A. Smith	42	21	31	8	19	22	143
Mrs. L. Anderson	23	27	23	22	29	18	142
S. L. Grenier	17	39	11	30	22	20	139
B. Chester	8	22	35	24	31	17	137
G. Williams	46	28	16	10	15	17	132
H. P. Clarke	34	6	7	1	0	17	65
HEAVY BREEDS.							
J. Ferguson	38	40	23	39	37	39	216
A. E. Walters	28	42	32	38	28	39	207
T. Hindley	45	27	37	30	36	28	203
E. Morris	33	33	13	41	17	38	175
R. Holmes	23	19	21	32	45	28	168
C. C. Dennis	37	18	7	37	37	28	164
E. Stephenson	32	23	35	18	21	34	163
Parisian Poultry Farm	22	25	25	45	7	35	159
R. Burns	18	13	49	5	39	38	157
E. F. Dennis	4	33	19	25	29	43	153
H. M. Chaille	3	42	21	46	36	0	148
J. A. Cornwell	28	4	27	29	27	25	140
Mrs. G. Kettle	4	27	35	0	0	28	94
A. Shanks	4	16	0	20	18	18	76
J. E. Smith	34	29	2	0	0	0	65
E. Oakes	0	26	0	36	0	0	62
N. A. Singer	6	2	9	7	0	33	57

CUTHBERT POTTS,
Principal.

PHALARIS.

Phalaris Bulbosa is described by the manager of the Bathurst (N.S.W.) experimental farm, as among the best winter grasses, and is therefore deserving of more attention from farmers. He is experiencing a strong demand for seed. A new grass from Africa, called wheat grass, is now undergoing trial at the farm, and, so far, it has proved promising.

The Orchard.

INTENSIVE CULTIVATION.

BY ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In a young country like Queensland, with its vast undeveloped areas, it may at first sight appear somewhat premature to advocate intensive cultivation, and yet when one considers the subject carefully it is very evident that one of the greatest mistakes our agronomists have made has been the tendency to acquire more land or to put a larger area under cultivation than they can possibly attend to.

This fault is not confined to one particular class, as there is a general tendency to grasp more land than the owners or lessees thereof can possibly utilise to the best advantage.

In no branch of agronomy is this more evident than in that of fruit culture, as many of the failures in this industry are directly attributable to the orchardist's attempting to handle a much larger area than he can manage, with the result that the yield of his fruit trees, vines, or other fruit-bearing plants is very much smaller than they would have been had they been given the care they required to produce a maximum return.

The importance of maintaining an orchard in a vigorous state of health and of maintaining the soil in a high state of fertility—in other words, the intensive cultivation of the orchard—has been pointed out by me in my writings on many previous occasions, as I have always maintained and still maintain that a small area properly looked after will frequently yield a greater net return than a much larger area that is more or less neglected.

During recent years there has been a very great increase in the number of small fruit holdings, both in the coastal districts of Southern and Central Queensland and also in the granite belt, a large proportion of the occupiers of such holdings being returned soldiers. These small holdings, if properly handled, are ample to support their owners in comfort, provided they are utilised to the best advantage; that is to say, that they are made to yield a maximum return.

This can only be accomplished by keeping the soil in a state of perfect tilth and in a high state of fertility, and by keeping the trees, vines, or other fruits free from disease and in a state of vigorous growth. These conditions can only be maintained on comparatively small areas, as they demand the constant attention of the orchardist, which they would not get did he attempt to handle a bigger area than he is capable of dealing with thoroughly.

The profits to be obtained by intensive cultivation would astonish those who have not gone into the matter carefully, as when land is kept in a high state of fertility and cultivation and is utilised to the best advantage it returns many times the yield it would do were it treated in the casual manner that many of our farms, orchards, and gardens are. To prove this, one has only to see the returns a Chinese market gardener gets off a small area which he works systematically and utilises to the best advantage.

Intensive cultivation demands two things:—One, the thorough preparation of the land and its maintenance in a state of perfect tilth; and the other, the maintenance of the fertility of the soil so that it contains an adequate supply of all essential plant foods in an available form. The former necessitates not only the working of the surface soil, but the deep stirring and pulverisation of the subsoil, so that the trees or fruit-producing plants grown thereon may be induced to root deeply, and thus be able to withstand dry spells much better than they would do were the majority of their roots near the surface.

The latter is not merely a matter of supplying the land with certain plant foods required as nutriment by the particular tree or plant, but, what is more important, the plant foods added to the soil must be available. No plant foods that are added to the soil in the form of commercial fertilisers can be made use of by any plant until they are dissolved in the water contained in the soil, as they can only enter the plant when in solution, and then only by means of the growing extremities of the finer roots.

It will thus be seen that, unless the soil retains an adequate supply of water, the application of artificial fertilisers will do little good, as the plant is unable to

PLATE 2.—BANANAS, MR W. E. DEAN'S FARM, BUDERIM MOUNTAIN.

make use of them. The retention of the necessary water in the soil is dependent first on the maintenance of the soil in a state of perfect tilth, so as to prevent the loss of moisture by surface evaporation; and, second, by keeping up the supply of humus or organic matter in the soil; as soils rich in humus have the power of absorbing and retaining more moisture than those that are deficient in this respect. Humus must be present in all soils in sufficient quantity, and when a deficiency occurs it must be made good either by the addition of farmyard manure or by the growing of suitable crops and ploughing them under—in other words, by green crop manuring.

Thorough cultivation and systematic manuring thus go hand in hand and are absolutely essential to the success of intensive cultivation.

Some years ago the Agricultural Chemist and the writer carried out a number of experiments for the purpose of determining the value of intensive cultivation as applied to the growing of bananas and pineapples, and the results of these experiments proved without a shadow of doubt that thoroughness in the culture of these two crops paid handsomely, and, further, that it was possible to so treat land that had been starved and neglected that it could be made to yield returns equal to those obtained from it in its virgin state.

Quite recently a further practical example of the results obtained by intensive cultivation has been brought under my notice, and, as the results are so satisfactory and show what good land properly treated is capable of producing, I purpose describing it for the benefit of our young growers, to many of whom it should be a valuable object lesson. In order that the description shall be as clear as possible, I am reproducing herewith photographs that were taken by Mr. Mobsby, the Departmental Artist, specially for this article, as they show better than any words of mine the effect of thoroughly preparing the land, maintaining it in a state of perfect tilth, and systematically manuring it.

The example to which I refer is on the property of Mr. W. E. Dean, Buderim Mountain, and consists of rather less than an acre of good volcanic soil that was originally scrub, and was first planted with bananas twenty-eight years ago. It remained under bananas for six years, when it was planted with paspalum and has since then been used as a grazing paddock, till broken up by Mr. Dean in 1919.

The paspalum when the land was broken up was saved, instead of being burnt, and was placed in the bottom of trenches 24 ft. apart, on the top of which banana suckers were subsequently planted 8 ft. apart in the row, or at the rate of 226 plants to an acre. Two hundred and nine suckers were planted in September, 1919. The land between the rows of bananas was well and deeply worked, and midway between the rows a double row of pineapples was planted, the lower side of the row being Ripleys and the upper smooths. The object of this method of planting the two varieties together was that the Ripleys, having a better hold of the ground, tend to keep the smooths from falling over. This principle is evidently a good one, as the plants of both varieties show a very healthy and vigorous growth; the colour is excellent, and they are bearing a heavy winter crop.

The soil is a deep volcanic loam from which the basalt stones and small boulders have been removed. It is in good heart, and, as previously stated, is kept in a thorough state of tilth.

During the spring of 1920 the land between the pineapples and the bananas produced a heavy crop of cucumbers, for which a very satisfactory price was obtained, and the cucumber crop was followed by peanuts which have recently been harvested, so that it will be seen that none of the land has been allowed to remain idle.

With regard to the bananas, selected suckers having large well-developed bulbs and a stem about 3 ft. 6 in. long were planted in September, 1919, and these mother plants bore their first bunches during the end of 1920 and early part of 1921. From the mother plant only three followers have been allowed to grow, and these at different intervals, and so spaced that no one sucker interferes with another. All superfluous suckers were removed by means of a spud bar some 4 ft. long and sharpened to a chisel point some 2¾ in. wide at one end. Such a tool does the work neatly and does not injure the parent bulb to any serious extent.

Of the 209 stools, each of the two oldest followers is now carrying a bunch, so that on less than an acre of land there are over 400 bunches, which average over 20 dozen individual fruits each, and one bunch had no less than 27½ dozen.

The photographs herewith give an excellent idea of the size of the plants and of the bunches, and the one looking up the centre between the rows shows that the bunches are on both sides of the row, or, as I have said, two to the stool. In one row the bunches are uncovered for the purpose of showing the fruit when taking the photo., but in the other row they are shown covered as a protection against cold nights.

PLATE 3.—A STOOL OF BANANAS, MR. DEAN'S FARM, BUDERIM.

The photograph showing a single stool, beside which Mr. Dean is standing, gives an even better idea of the growth; and the second follower in the foreground, which has made its entire growth during the present year, measures no less than 45 in. in circumference at the ground level.

The land is kept well worked right up to the pines and bananas, and there are no surface roots. The bananas are manured twice annually—the end of August and during February—when they receive either 2 lb. of dried blood, 1½ lb. of superphosphate, and 1 lb. of muriate of potash per stool at each application, or 4 lb. of meatworks manure and 1 lb. of muriate of potash per stool. The manures are distributed around the stools and are well worked into the soil, and cost at the rate of £25 15s. 9d. per acre. When the returns are taken into consideration, this is a reasonable expenditure; further, once the initial expense of preparing the land and planting the crops has been met, the upkeep of the land has been light, as it is in such good order that its cultivation is a simple matter. Horse, not hand, culture is employed, as there is no fear of damaging the roots.

The gross returns from this plot of land of less than an acre in extent will probably amount to over £400 in the year, provided the prices now being realised for bananas in the Southern markets are maintained, as the crop of fruit actually in sight is not far short of 300 cases, and, unless something at present unforeseen happens to destroy them, this quantity should be marketed. Mr. Dean's success is the result of good work well carried out, a striking example of the benefits to be derived from intensive cultivation, and a proof of my statement that a small area well worked will frequently yield a greater net return than a much larger area indifferently looked after. His success should also be an encouragement to many young growers who, instead of utilising their land to advantage, are frequently dissatisfied with the smallness of their holdings and think that they would do better if they had more land. In the majority of cases this is the greatest mistake they can make, as if they are not able to work a small area profitably they will have little chance of working a larger area to better advantage.

THE MARKETING OF FRUIT IN CALIFORNIA.

BY H. W. MOBSBY, F.R.S.A.

While in America as one of the Queensland representatives at the World's Fair at San Francisco in 1915 I was much impressed with the manner in which various fruits appeared in the city shop windows as they came in season. The product from the tree to the table had been properly graded, wrapped, packed, and displayed in the retail establishments in such an inviting way as to make its purchase irresistible. The high level of standardisation helped the fruit to sell itself, and made every buyer a "booster" for the home-grown product. One's curiosity as to Californian marketing methods was aroused and knowledge that might prove useful to the Queensland grower eagerly sought.

Being in San Francisco through the complete seasonal cycle and having observed how fruit retailing was done, I made it my business to call on the local executive of the California Fruitgrowers' Association. I was fully instructed on the Association's sale system and advertising campaigns, and obtained many samples and examples of its sale-compelling publicity.

I was informed that the Association was one big co-operative organisation, handling the production of some 6,000 growers (this number increased later to 8,000) and distributing and marketing through three systems. These were:—(1) Local associations of growers; (2) district exchanges; (3) Central or California Fruitgrowers' Exchange.

The three systems are organised and managed by the growers on a non-profit co-operative basis, each operating at cost, and each distributing the entire net proceeds to the growers after operating expenses are deducted.

(1) Local Associations or Exchanges.—The members (growers) usually organise as a corporation without profit under the laws of California, issuing stock to each member in proportion to his bearing acreage, to the number of boxes he ships, or in equal amounts to each grower.

The local association assembles the fruit in a packing-house and there grades, pools, packs, and prepares it for shipment. It is governed by a board of directors through a manager, and conducted exclusively for the benefit of the growers.

The fruit is pooled each month, each grower having his proportion of the proceeds received for each grade shipped.

Many of the associations pick the fruits, and some of them prune and fumigate trees for their members.

Each association has brands for each grade.

(2) District exchanges are corporations without profit. There may be one or more district exchanges, depending on the number of local associations. The district exchange acts as a clearing-house in marketing the fruit for the local associations through the Californian Fruitgrowers' Central Exchange, and as a medium through which most of the business relations between the exchanges and the local associations are conducted.

(3) The Californian Fruitgrowers' Exchange is formed of district exchanges governed by a board of seventeen directors through a general manager, one director representing each district exchange, and furnishes marketing facilities for the district exchange at a *pro rata* share of cost, places bonded agents in the principal markets of the United States and Canada, defines the duties of agents and exercises supervision over them, gathers information through them of conditions in each market, and receives telegraphic advices of the sales.

The exchange business is on a cash basis, makes prompt accounting of returns to the growers through the district exchanges, conducts extensive advertising campaigns to increase the demand for fruit, develops new markets, and performs other collateral functions between the Central Exchange and the district exchanges.

The Central Exchange levies an assessment against each district exchange for a *pro rata* share of the expense on the basis of the number of boxes shipped.

It does not buy or sell fruit or any other commodity, and exercises no control either directly or indirectly over sale or purchase, its function being to provide facilities for distribution and marketing of the fruit of those shippers who desire such facilities.

The Exchange being a democratic organisation, the growers exercise control over all matters and may withdraw from an association at the end of the year, or the association from a district exchange, or a district exchange from the Central Exchange. These relations are set forth in the various contracts that hold the members together.

The Exchange is organised into several divisions—Sales, Legal, Traffic, Advertising, Insurance and Mutual Protection, and a Supply Department, which furnishes the materials used in the packing-houses and on the ranches at cost to the members; and also directs an advertising campaign which is carried on in all important cities of the Union.

The expense of maintaining the Exchange, including advertising and every other expense, has never been higher than 3 per cent. of gross sales.

THE RIPE OLIVE: ITS FOOD VALUE.

Olives are harvested both ripe and green for pickling, as well as for oil. The ripe olive is too often considered as a relish than as a food. As to its food value there is no doubt as an examination of the following table showing the analysis (made by Professor M. E. Jaffa, University of California) of the ripe olive, green olive, pickles, bread, rice, and potatoes:—

Per pound.	Calories.
Olive, ripe	1,136
Olive, green	598
Pickles	110
Bread	1,215
Rice, raw	1,630
Rice, boiled	525
Potato, raw	385
Potato, boiled	440

The percentage of fat or oil is twice as much in the ripe olive than in the green olive. According to chemical analysis this appears to be the main difference between them. This, however, is not the only interesting point brought out by a study of the

table. Bread is generally considered to contain, weight for weight, far more nutriment than the olive, yet as far as total food value or heat unit is concerned, it will be noted that 1 lb. of ripe olives contains practically eleven-twelfths of the caloric value of bread.

Again, if the ripe olive is compared with raw rice, it will be seen that rice ranks far ahead in total food value—that is, in 1 lb. of raw rice we have much more nutriment than in 1 lb. of ripe olives. If, however, the rice is boiled its food value is reduced to practically half that of ripe olives.

It is not always correct, however, to compare food values on the basis of caloric content, because very often the real value of the food to the body depends on the ingredients more than the caloric value. For example, 1 lb. of sugar contains 820

PLATE 4.—A FRUITED SPRIG OF RIPE OLIVES GROWN AT DALMALLY, NEAR ROMA.

calories, 1 lb. of meat less than 1,000; yet one would hardly say that 1 lb. of sugar is equal to 1 lb. of meat where the question of growth is concerned.

Summarising, it may be said that the ripe olive is a very valuable, palatable, and easily digestible form of food, and should be considered as such and not as an accessory or condiment.

Olives find Queensland conditions very congenial, as may be judged by our illustration of a fruited olive branch grown in the homestead garden at Dalmally, Mr. W. A. Russell's property, near Roma. The photo is by Mr. H. W. Mobsby, F.R.S.A., of the Department of Agriculture.

DEHYDRATION.

Californian dehydrated fruit producers are (*vide* "California Grape Grower," April) strongly organising for the purpose of standardising, advertising, and otherwise controlling and directing the commercial side of their enterprise.

The points listed hereunder comprise an epitome of ideas expressed in the course of proceedings of a meeting of producers at San Francisco on 8th March last, and are cited for their topical interest.

POINTS FOR PRODUCERS.

Before any attempt is made to standardise dehydrated products, it will be necessary to standardise methods of production.

The demand for canned and dried fruits is insufficient to relieve market congestion in seasons of plenty. It is necessary, therefore, to seek to produce a dehydrated article that will create a distinct and separate demand—an article that is different from canned fruit and absolutely superior to sun-dried fruit.

It is desired to offer something tasty, absolutely sanitary; something that will occupy small space, will not spoil, and that will keep indefinitely.

The experimental stage of dehydration has passed. An article can now be produced thoroughly suited to the most exacting and refined taste.

Standardisation, either in methods of production or marketing, cannot be done individually. Associated effort on the part of dehydrated fruit producers is essential.

The public must be educated. People must be made familiar with the idea of dehydration, and popular demonstrations as to its forms and culinary use must be conducted at central points.

The question is not that it can be done, but how. Quality and uniformity of the product are essential if public demand is to be created. Quality of production alone determines the value of a dehydrating plant and its output.

Standardise and advertise.

At the meeting, the Pacific Coast Dehydration League was formed and an active organisation established to work along the lines suggested in the foregoing summary.

In the course of the week a parcel of dehydrated peaches was received at this office from Mr. R. G. Booth. The fruit was soaked in water for about twenty hours. Half was cooked in the water in which it had been soaked, and half in fresh water. In each instance the reconditioning as regards flavour, colour, and texture was good, though varying. That cooked in the water in which it had been soaked retained its full flavour and texture, and was equal in every respect to fresh fruit. That cooked in the second water was not equal in flesh texture or flavour to the other. It is apparent, then that, in order to retain the essential qualities of the product in the process of preparation for the table, it is advisable to use the first water, *i.e.*, the water in which it has been soaked.

Our illustrations show (1) a sample of dewatered peach in its treated form, and (2) the fruit reconditioned.

THE 1921 SUGAR CROP.

At the end of last year the indications were that a record sugar crop would be harvested during 1921. Due to various causes—too much rain and absence of humid heat in some districts, too little rain in others, and the severity of the grub pest in the Hambledon and Mulgrave areas—the original estimates have been much reduced. The present approximate estimate, we are informed by the General Superintendent of the Bureau of Sugar Experiment Stations (Mr. Easterby), is 250,000 tons of sugar. This, if realised, will be the best year Queensland has seen for sugar production, with the exception of 1917, when the yield was 307,000 tons. It may, therefore, be described as an exceedingly good crop.

Photo. Dept. Agriculture and Stock.]

PLATE 5.—DEHYDRATED PEACH.

1.—The Marketable Product.

2.—Reconditioned and Ready for Cooking.

(Natural size.)

Horticulture.

TREE PLANTING FOR SHADE AND SHELTER.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

A thing that strikes visitors from other countries to the rural districts of Queensland is the absence of trees. Of course, on the plain or downs country this is natural, but where trees were originally plentiful they in many cases have either all been cut down or ringbarked. This is, surely, evidence of a great lack of foresight in clearing operations. I know stockmen will say, "You can't have both trees and grass"; that may be so in a general way, but in forest country a few trees for shelter will benefit stock considerably. Many a wind-swept, sun-scorched paddock would be vastly improved by a judicious system of wind breaks—belts of individual, or small groups of trees here and there. On large holdings groups would be better. Fine examples of this may be seen in brigalow country where groves of these fine trees provide excellent shelter. The planting of trees or the preservation of indigenous timber has not received the attention it deserves, as the bare condition of many homesteads and paddocks testify. That stock appreciate shade is evident by the way in which on a hot summer day they may be seen seeking shelter from the sun, if it is only alongside a stunted bush or underneath a small tree. Even sheep on open country may be seen in the middle of a summer's day crowding along dry watercourses taking advantage of what shelter the stunted bushes afford. Another point that should not be overlooked is that in drought time judicious lopping would provide quite a lot of feed for stock. Even the Moreton Bay Fig, where it would grow, could be used for this purpose, and the Carob Bean (*Ceratonia siliqua*) planted as a shelter belt would provide a lot of nutritious fodder from its pods.

Where it is intended to plant lines or belts of trees the ground may be prepared by ploughing and subsoiling. Work it well to a fine tilth, then open the holes sufficiently large to spread out the roots of the plants. In such a belt, plant thickly, say 12 to 15 ft. apart, and two, three, or more lines diagonally, the object being to get a thick belt of trees in a short line. Groups may be planted in various shapes, such as triangle, crescent, or horseshoe, or other formations that may be desired; very large growing trees may be planted much further apart, say up to 40 or 50 ft. When planting, in opening the holes place top soil on one side, then remove the next layer and break up bottom of hole with a pick. If any dead grass or leaves are handy, put a layer in the bottom of the hole, then replace lower soil which, if very poor, may be much improved by the addition of some farmyard manure fairly well decomposed. Place the tree and fill in with the surface soil, tramp firmly around the roots, and leave a depression or "saucer" around the base of the young tree to hold water. Water well and mulch the surface lightly to graduate evaporation. July and August are good months to plant, for all kinds of trees, and are the only months for the planting of deciduous kinds. February and March are also good months for trees planted out of pots. Young trees must, of course, be protected from stock by either tree guards or fencing, and they will repay the trouble of keeping the surface free from grass or weeds by their better growth; also it will be a protection from fire. Watering occasionally will be necessary until the trees get a good hold of the ground.

In giving a list of what to plant, difficulty is experienced in keeping it from being too lengthy. For shelter belts grow *Araucaria Cunninghami* (hoop pine), *Callitris robusta* (cypress pine), carob bean (*Ceratonia siliqua*), *Olea Europea* (olive), *Eucalyptus tessellaris* (Moreton Bay ash), *Grevillea robusta* (silky oak), *Pinus longifolia* (Himalayan pine), Casuarinas (she-oaks), *Acacia aneura* (mulga), *Celtis australis*, and *Platanus orientalis* (plane tree), the two latter being deciduous.

For individual planting or small groups choose *Eucalyptus tessellaris*, *Ficus Benjamina* (weeping fig, warm districts), *Ficus Hillii* (Hill's weeping fig), *Ficus macrophylla* (Moreton Bay fig), *Flindersia australis* (crow's ash), *Gmelina Leichhardti* (Queensland beech), *Pinus longifolia*, and plane tree. For Western Downs and cold districts the best to plant are *Albizzia Lebbek*, *Schinus molle* (pepperina), *Melia composita* (white cedar), Kurrajong (*Sterculia diversifolia*), broad-leaved bottle tree (*Sterculia trichosiphon*), and *Sterculia rupestris* (narrow-leaved bottle tree).

GARDEN NOTES.

Rose pruning should have been finished last month, and the plants should now be making a good start. The first thing after pruning is to manure well with well-decayed manure; if this is not available, a good sprinkling of bonedust is beneficial. Work it well into the soil without unduly disturbing roots. Should dry weather prevail, do not let the plants suffer for want of water. Be particularly careful of newly planted roses, for many are lost after making their first growth through being allowed to dry and the plants being unable to stand a severe check. Keep a sharp lookout for insect pests and deal with them as they arise. Rub off any superfluous shoots such as those that grow across centre of plant; this will ease the annual pruning and benefit the plants.

Flowering shrubs not already pruned should be attended to at once, and beds prepared for summer flowering annuals. Keep the surface soil loose and in a good state of cultivation by running the dutch hoe over frequently.

This is about the best month to break up and replant old gerbera plants. Before lifting, cut off all the old leaves, leaving only the young or last ones; then lift and separate the "clumps" of old plants and replant. A change of position is beneficial. Work in a good sprinkling of lime through the soil and be careful not to bury the crowns.

Another planting-out of some of the hardier flowering plants can be made, such as antirrhinum, coreopsis, calliopsis, gaillardia, verbena, petunia, cornflower, and dianthus. Sowings of seed of aster, zinnias, amaranthus, celosia, petunia, balsams, and other summer-flowering annuals may be made.

STOCK POISONING BY "WHITE CEDAR" BERRIES—A REPORTED REMEDY.

Mr. Walter L. Guy, Rockhampton, writes:—

Just about twelve months ago I communicated with you about eleven young pigs poisoned by "White Cedar" berries.

Now I have just had a similar experience, but have been successful this time, and with the hope of helping other inquirers I will relate the details. Owing to congestion in my pigstyes I was forced to put 6 months old Berkshire pigs in a fowl run adjacent to which is growing a large White Cedar, which I value for its shade. Owing to business delay I did not arrive in time to feed the pigs. Getting hungry, they charged the wire netting and got at the berries. About an hour later I was able to attend to them, and immediately saw what had happened. Remembering my previous experience, I tried to think of the best way out. This is what I did: First of all I administered a big dose of castor oil to each, and this caused four to vomit a lot of berries. Half an hour later I gave them each a dose of Epsom salts, two packets per pig, in milk from a pint bottle. The dose was administered with each pig lying on its back with head held up. Two hours later they received a bran and hot milk mash, which had to be forced down their throats, as they were too sick to take it naturally. I heavily cut their ears to relieve blood pressure, as that symptom is first to show. I then prepared a deep warm bed for them, and at 9 p.m. administered 3s. worth of raw brandy mixed with three double handsful of bran formed into balls and forcibly fed. This on account of their evident suffering from shock and cold. The net result was that one died and the rest are alive and as well as ever. The one that died was harder to catch than the others and its treatment was delayed in consequence.

Tropical Industries.

1921 CANE CROP PROSPECTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, who has returned from a visit to the northern sugar districts of Mackay, Proserpine, Lower Burdekin, Innisfail, Babinda, and Cairns, comments as follows on the 1921 cane crop prospects:—

The anticipations of a record crop formed at the end of last year are not going to be fully realised. Excessive rain in some districts, insufficient rain on the Lower Burdekin, and grub damage at Cairns have checked growth. The crop all round, however, will be good.

At Mackay the crops have stooled out well and have a beautiful appearance, but the growth in length is disappointing. This is principally due to the fact that while the wet season has been very heavy there has not been sufficient hot and steamy weather this season to ensure a maximum growth of cane.

A comparison of the average maximum temperature in 1919, 1920, and 1921 for the first three months of the year shows the following results:—

	1919.	1920.	1921.
January	90.2	89.5	87.1
February	90.0	87.2	84.9
March	91.0	88.9	82.7

These statistics show that the temperatures in 1921 for February and March were considerably lower than in either 1919 or 1920, and must have had a marked influence on the making of the cane during the best growing period. The ratoon crop also is not so forward as usual. However, it is expected that a satisfactory yield of cane will be harvested, and the present estimated output of the mills is between 45,000 and 50,000 tons of sugar for Mackay district. New land is being brought under cultivation at Mackay principally to the south along the new line of railway to Rockhampton. There are about 3,000 acres of fine land near Carmilla, and a good deal of this is already settled and producing cane. The Plane Creek Central Mill are putting in about 4 miles of tramway from the main line to the area in question. About twenty settlers have taken up land, and it is expected that next season about 15,000 tons of cane will be sent in to the mill. There are other good pockets of land along this line which are also being brought under cane. The opening up of these new lands and the additional cane to be supplied to the Plane Creek Mill will add largely to the prosperity of the Mackay district, and will also increase our average sugar production.

The Sugar Experiment Station at Mackay is looking particularly well; and the growth of cane for the season upon the experiment plots is very satisfactory. The new West Indian canes are doing well, as are also the Java and Hawaiian canes. The annual field day of the station will be held on Saturday, 2nd July.

Due to the continued rain in the Mackay district, little or no early planting has been carried out.

At Proserpine the cane is also backward for the same reasons as are mentioned in connection with Mackay. Rain was falling every day during the time of inspection, and farmers were being sadly hampered in their preparatory cultivation. Due to this fact, the early planting this year will be negligible. The district of Kelsey Creek has very greatly improved and a number of new areas have been brought under cane. Some very fine crops of Badila were seen here along the creek banks. There is still a good deal of land in the Proserpine district that might profitably be put under cultivation when means of transport can be provided.

The transition from the wet districts of Mackay and Proserpine to the dry belt of the Lower Burdekin is particularly marked this year. After about a fortnight of rain and mud in the Mackay and Proserpine districts, the Lower Burdekin areas were found to be exceedingly dry and dusty. Since the beginning of the year only 15 in. of rain had fallen up to 30th April. This has been increased by a fall of 3 to 5 in. in May, while at Proserpine about 70 in. have been registered. These two districts are not very widely separated, but there is a vast difference in the climatic conditions. This appears due to the fact that there are no ranges of mountains

coming in close to the seaboard in the Ayr district. This district has, therefore, to rely upon irrigation, and if this is applied in time good crops are generally secured. Owing to its high cost, however, a temptation to wait for rain in the early part of the year, when it is most usual, manifests itself, and many growers hold off irrigating in the belief that rain will fall. When it fails to do so to any extent, as in this season, growers pay the penalty in reduced crops, while those whose faith was not so strong and who applied water early reap the benefit. The consequence this year is that those who did not irrigate early are doing so late, in order to save the crop, and many of the pumps were hard at work providing water for the cane. Although the cane is backward, for the most part it looks well and healthy. An interesting feature in this district is the introduction of windmills for irrigation. So far there are not many of these, and they are only being used on small areas. It is stated, however, that 24-ft. mills to work 18-inch pumps, giving a flow of 15,000 to 20,000 gallons per hour, are to be erected, and the work done by these mills will be watched with keen interest, as they should tend to considerably lessen the cost of the application of water. The experiment plot upon Mr. James Mackersie's farm was found to be progressing satisfactorily. New varieties from Java and Hawaii were sent up from the Bundaberg Sugar Experiment Station in April, and these had been planted out and had germinated well, the Hawaiian 227 being on the lead. On the Home Hill side of the river the cane, though backward (except where irrigated), is looking well. The completion of the electric power scheme in connection with irrigation is eagerly awaited, farmers at the present time being much handicapped under dry conditions. Varieties sent to the Lower Burdekin district from the Sugar Experiment Stations from time to time have been of the utmost benefit to this district, the main cropping sorts being the Badila and Gorus, which took the place of the Imperial Cane some fifteen years ago. Many of the Queensland varieties are also being grown, the high-density cane known as Q.813 doing very well.

Leaving the dry areas of the Lower Burdekin, the next district visited was Innisfail, which, with Babinda, is the wettest part of Australia, and this year the rainfall has been high. Up to the middle of May some 136 in. of rain had been precipitated at Innisfail. This heavy rainfall has undoubtedly checked the growth of the cane to some extent, while the softening of the soil and high winds have caused much of the cane to fall. Nevertheless, there is a fine crop in this district, and the cane is green and healthy. All the mills anticipate good crushings. Very little damage by grubs has occurred on the Johnstone this year. At the Sugar Experiment Station a very fine crop will be harvested. Badila cane six to seven months old, first ratoons, had all the appearance of a 40-ton per acre crop. The various experiments in fertilising, cultivation, and subsoiling all look magnificent, while the variety canes have also made astonishing growth considering the comparatively poor nature of the soil. Owing to the waterside workers' dispute at Mourilyan, the South Johnstone Sugar Mill had still 3,000 tons of last year's sugar to get away, and a good deal of this has deteriorated in the abnormally wet season. The Maria Creek soldiers' settlement is going ahead. Sixty-seven ex-service men are on the land so far, and twenty-one farms are now under cane. It is expected that 157 farms in the Innisfail side of the range will be taken up.

At Babinda the rainfall was found to be even greater than at Innisfail. Up to the 14th May some 186 in. had fallen. This enormous rainfall had caused floods, which had damaged the cane, about 120 acres being affected. Of this amount 30 per cent. is estimated to be damaged beyond recovery, but this is only a small percentage of the entire area. The damage by grubs in the Babinda area this year is, fortunately, not great, being principally confined to the northern end, about Fig Tree and McDonnell's Creek. The cane has a fine, healthy appearance, and the crops should cut well. The Babinda Mill expects to treat 150,000 tons.

At Cairns the devastation by grubs this year has been most deplorable. Old growers state that such an outbreak has never been seen for years. The principal damage has been at Green Hills and around Hambledon and Mulgrave, and it has resulted in the estimates of the Hambledon and Mulgrave mills being reduced by some 50,000 tons. This only shows the magnitude of the problem and the enormous losses that the unfortunate grower has to suffer in given years. Floods have also caused a good deal of damage on the Mulgrave flats. The cane not damaged by flood or grubs is looking magnificent, and comparatively large crops will be harvested both at Hambledon and Mulgrave. At the latter place many improvements have been made in the mill, and its capacity is being largely augmented in order to deal with about 50,000 tons more cane which, due to a re-arrangement of areas, is expected next year.

During the course of Mr. Easterby's tour seven lectures on cane-growing and increasing production were delivered. At the close of each meeting, all of which were well attended, discussions ensued, and a great deal of interest in the various questions of cane-growing, cultivation, and fertilising, was displayed.

it may be expected that, despite the checking of the growth by too much rain and damage by floods and grubs, the crop will be very much larger than any since 1917. This is mainly due to the drought having broken and to the increased areas that have been put under cane. In the course of the next week or so the Bureau will be in a position to issue an approximate estimate of the 1921 crop.

It is unfortunate that, owing to the very wet weather in North Queensland, very little early planting has been done this season, so that a great deal of leeway will have to be made up later in the year.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 8th June, 1921:—

During the past month a further inspection was made of the Mackay district, also Carmilla, and the Bundaberg and Avondale cane areas.

MACKAY.—This district was dealt with in last month's report, but an interesting tour over the Carmilla Creek country revealed some very fine cane land. This area is situated some 30 miles south of Sarina, and is not promising to look at from the railway siding, but on following the route of the new tramline, which is being built by the Plane Creek Milling Company, the hills fall back from the stream, and some thousands of acres of fine alluvial and forest flats are to be seen. Already new settlers are pushing in there, and the old-established ones are vigorously clearing and planting land hitherto used only for grazing.

The topsoil is deep and well drained, while the subsoil is mostly a porous loam. In the wet season there is a heavy seepage.

The timber growing on this country is mostly bloodwood and ironbark. There are plenty of other varieties, but these two are principally in evidence.

Of the cane already growing on Carmilla Creek, there are some very fine crops of D.1135 and 1900 Seedling. It is probable that these two canes could safely be grown as staple varieties. They are displaying all the characteristics of the best types, and are free from disease of any kind. Other canes would, however, do well, especially such varieties as Q.855, 813, 426, 285, Badila, N.G.24A and 24B.

The geological formation shows nothing apparently of outstanding importance. Many of the peaks are of volcanic origin, although not much of the agricultural country is of volcanic nature.

The spring water in this locality is good, and would be suitable for irrigation. There is always abundant water in Carmilla Creek.

Every facility for getting about was afforded me by the Plane Creek Company. This organisation is to be congratulated on the speedy erection of bridges and preliminary work in connection with the new tramline.

BUNDABERG.—In the Bundaberg district the cane looks well. The season has been a very good one, and the farmers should have nothing to complain of regarding tonnage.

The different Queensland seedlings mentioned in previous reports are going to give splendid results. Some very fine blocks of Q.813 are in evidence at the present time. 1900 Seedling looks well, although the ratoons are not so heavy in stool as they might be. On the Qunaba plantation Badila is making a good showing, although it is not growing to a perfect type of that variety such as seen round Cairns. Cane pests are not numerous. There appears to be a higher percentage of mortality among cane grubs this season than previously. Borers are being greatly checked, perhaps by the ravages of small ants, which are swarming in the cane.

On the areas north of Bundaberg equally favourable conditions prevail. Autumn-planted cane has struck well. There is no evident disease. Even canes usually susceptible to leaf infection have this year a normal healthy green colour. An insect parasite is attacking, in a minor way, the leaf midriff in D.1135.

Varieties mentioned in previous reports on these areas are all doing well, and should still make considerable headway between now and the end of June. A mild winter is anticipated.

AVONDALE AND MIARA.—Fine growing weather has prevailed for the last six weeks, and the tonnage at the time of cutting should be satisfactory. The growers have the upper hand regarding weeds, and are not worried with cane pests. Some of the autumn strikes of plant cane were not quite satisfactory, possibly the cause of this being that the farmers, anticipating a dry spell, covered too deeply.

At Avondale the canes looking best are D.1135, 1900 Seedling, and Yuban. The latter variety has taken a great hold of the ground and is ratooning well, but the canes are thin. It is not a cane to be recommended to the small farmer for planting, especially as there are several very good varieties already widely known that he can plant with better results.

At Miara such canes as B.208, N.G.40, 1900 Seedling, and D.1135 are all growing satisfactorily. There is some excellent cane-growing land in this locality, with a loose well drained subsoil. Much headway ought to be made here by the growers if they devote their time exclusively to cane culture. The principal difficulty is transportation.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 9th June, 1921:—

In the course of the month of May the following districts were visited:—

INNISFAIL.—Up to the 9th of May the rainfall for this area was 126.96 in. This excessive fall has been a very serious drawback to cultivation. The chief cane grown in the area is Badila and some very good plant crops of this are to be seen. H.Q.426 is only represented by a small percentage. It does not seem to do well in the wet areas and appears to be liable to disease. Very few other varieties are to be seen, but a number of farmers expressed their intention of planting a few of the new varieties from the South Johnstone Experimental Station.

Growers are now using lime to a greater extent than formerly and speak well of its effects upon the crops. Green manuring is also increasing in favour. Up to time of writing grubs or borers were not causing much trouble in this area.

SOUTH JOHNSTONE.—Some very fine crops of plant and ratoon cane are to be seen in this area. Upon both the red soils and alluvial excellent results should be obtained. Practically nearly all the cane is Badila with a small percentage of 24, 24A, 24B, and H.Q.426. Owing to the constant wet weather very little early planting has been possible. Borers are active. Grubs are also doing a certain amount of damage on red soil country, the most affected part being on the 17-mile area. This is mainly old banana country, and some of the farmers are having a bad time. One farmer here used arsenic at the rate of 2½ cwt. per acre on his plant cane. The land was cane holed, the plant laid down, and a little soil on top of it, and later on the dressing of arsenic and the balance of soil. The plant cane looks extremely well.

So far very few tractors are in use in this region as a very big area of the land has yet to be stumped.

Whilst at South Johnstone the Maria Creek Soldiers' Settlement was visited. There are about 24 settlers at work upon their blocks, and they will probably harvest about 100 acres of cane this year. The cane is backward in growth, due to continual wet weather and lack of warmth. The railway authorities expect to have the line through by the end of October or early in November.

BABINDA.—In this district the rainfall has been very heavy. Up to the end of May 187.38 in. were recorded. Farming work has been seriously delayed. Grubbing is being carried out in all parts of the area and the extent of cultivation for 1922 should be considerable. Plough teams and tractors are also very busy.

Although the rivers and creeks were in flood several times this year the damage caused was not as much as one would expect, only a few farmers being badly affected. Although grubs are to be seen they had not done a great deal of damage up to time of writing. Borers are still about, although evidently the parasitic flies have helped to keep them in check.

The principal cane grown is Badila of which about 90 per cent. will be harvested. Other canes are 24, 24A, 24B, H.Q.426, 1900 Seedling, D.1135, B.147, and B.208. Of these the Gorus seem to promise best results.

Very little manuring has so far been carried out in this area, but numerous growers intend using lime and artificial manures. Returns from the manured areas have so far been very satisfactory.

BOWEN.—The Bowen district was visited early in April and the cane areas adjoining the Don River were green and healthy, and should develop into good crops. The cane areas are very small, as fruit growing and mixed farming generally are mostly favoured. Farmers interviewed who are now growing cane expressed their intention of increasing their present area, as the Proserpine mill is anxious to get a larger supply from this district. The principal varieties noticed were H.Q.426, 24, 24A, and 24B, and Malagache. Mr. J. Nichol has a number of varieties planted, and amongst them D.1135, 1900 Seedling, 24B, and H.Q.426 look very healthy. Several of the farms have small irrigation plants, and the cane thereon looks extremely well. Liming and green manuring would benefit most of the farms visited.

PROSERPINE.—At Proserpine very heavy rain had been experienced—January 14.96 in., February 15.25 in., March 26.87 in., and April to date 3.16 in., or a total of 60.24 in. This gave the ground a thorough soaking and delayed all farm work. The soil is mostly a dark alluvial, covering a clayey subsoil necessitating surface drainage, and in other places a sandy subsoil is found. Some very good scrub land is found upon the river, and creeks. The various districts are well served with tram lines. Samples of soil taken show the need of drainage and liming in most cases. I am informed that burnt lime at £4 5s. per ton and earth lime at 27s. 6d. per ton delivered at Proserpine can be obtained.

So far very little cane disease has troubled this district. Several tractors are in use, the owners claiming that although very expensive to work lately on account of high cost of fuel yet they are a good investment when large areas have to be prepared. The principal varieties of cane harvested last season with their average c.c.s. are as follow:—

Variety	Average c.c.s.	Proportion of Crop.
H.Q.426 (Clark's Seedling)	15.2	23 per cent.
Malagache	13.2	18 per cent.
Goru	13.6	16 per cent.
Badila	14.4	13 per cent.
S. Singapore	13.1	10 per cent.
D.1135	13.3	8 per cent.
1900 Seedling	14.3	4 per cent.

and 13 other varieties amounting to only a proportion of 8 per cent. of total crop.

Q.1121 and Q.813 together were represented by only 1 per cent. of crop, and they had an average density of 13.1 and 14.3 respectively. A far larger proportion of Q.813 is now, however, being planted as this cane is rapidly increasing in favour.

Grubs were found last year in isolated places and about 5 tons of beetles were paid for early this year by the Farmers' Association. At Strathdickie, Mr. R. Redhead suffered somewhat from grubs in 1920. He then planted a crop of corn and when plowing out same, found numerous grubs about. When planting this with cane he put arsenic to the amount of 80 lb. to the acre in the drills with the plants, and then covered over with soil. The cane (Clark's Seedling) now looks very well. Upon the river bank Ruge Brothers have a very fine crop of 1900 Seedling ratoons. It is a good colour and has stooled out well. A large area of land is now being cleared by the use of 2-horse grubbing machines, supplied to the farmers at a weekly rental by the mill management. The use of these is much appreciated, and judging by present results should very materially aid in a larger area being placed under cultivation in the near future.

With present weather conditions the mill should harvest a tonnage of about 60,000 tons for 1921.

HERBERT RIVER.—The conditions here, too, had been extremely wet, preventing ploughing and cultivating generally. The two mills should approximately cut 220,000 tons. The soil generally is a dark or light coloured alluvial loam, covering clayey and sandy scrub soils. The principal varieties of cane grown are H.Q.426 (Clark's Seedling), N.G.15 (Badila), Gorus, 24, 24A, 24B, Black Innis and 1900 Seedling. The Colonial Sugar Refinery are also now distributing the variety known as H.Q.409. It is said to be a good striker, and a very large stooler, and is of good density. A number of tractors are in the district, but the horse is still doing the greater amount of the work. Owing to the absence of seed very little green manuring has been possible. Liming is increasing in favour everywhere, and when used the crops show up correspondingly. Mr. Glover of Hawkins Creek used about 2½ tons of earth lime to the acre on his first ratoons, and a couple of months later 2 cwt. per acre of blood manure. The cane looks very fine. Mr. Enticknap also used 1 ton to the acre of lime on a 12 acre block of plant cane, this also looks better than his unlimed cane. Also upon the abovementioned block was a small patch of land that repeatedly failed to grow cane, but, after liming, this piece is well up to the average of the block. Grubs are showing up in several parts of the district and may yet do some damage to the growing crops. At Halifax, Mr. Skinner is now carrying out an interesting trial. His farm always suffers very badly from this pest, and so after ploughing in a crop of cow pea and subsequently planting, he used arsenic at the rate of 40 lb. to the acre, running the arsenic mixed with a little lime through a manure distributor, and as close as he could to the cane, covering over with a disc harrow; later on he used a top dressing of about 2 cwt. sulphate of ammonia to the acre. This cane now looks splendid although in a place where grubs always show up early.

Although I have not noticed it, I was informed that borers were in evidence on a few farms. It must be emphasised most strongly that the utmost care should be taken in selecting plants from any of these infested paddocks.

Forestry.

QUEENSLAND TREES.

BY C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 4.

YELLOW SASSAFRAS (*Doryphora sassafras*).

Common Names.—Yellow sassafras, Sassafras, New South Wales Sassafras, Golden Deal.

Derivation: Gk. *dory,* a spear; *phoreo,* I carry (alluding, perhaps, to the bristle-like points of the anthers), sassafras is the name of a well-known North American tree with a similar fragrance.

Description.—A large tree attaining a height of 120 ft. and a barrel diameter of 4 ft. Barrel not prominently flanged. Bark grey, sometimes slightly wrinkled and finely scaly; when cut it is brown and measures 7/16 in. thick on a tree with a barrel diameter of 2 ft. 4 in., sapwood pale. Heartwood deep yellow. The bark and sapwood are fragrant, but the sassafras odour of Queensland specimens is not so strong as in *Cinnamomum Oliveri.* Young shoots and flowers downy with silky hairs; adult leaves and branchlets hairless. Leaf stalks $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Leaves opposite, elliptical, narrowed at the base, the apex with a blunt point, margins coarsely toothed, lateral nerves and net veins more conspicuous on the underside; measurement of leaf blade, $1\frac{3}{4}$ to $3\frac{1}{2}$ in. long; $2\frac{1}{2}$ to $3\frac{1}{4}$ times as long as broad. Flowers in small bunches in the forks of the leaves. In each flower-bearing fork there are one or two stalks (peduncles), measuring from $\frac{1}{6}$ to over $\frac{1}{4}$ in. long, at the top of which are generally three silky downy flowers each on a stalklet about $\frac{1}{4}$ in. long. Individual flowers about 1 in. in diameter when expanded. The outer part of the flower consists of six perianth lobes tapering into fine points. On the inside of the perianth lobes and opposite to them are six stamens nearly as long as the perianth lobes; the anthers or pollen-containing organs of the stamens are situated towards the base of the stamens and are surmounted by long bristle-like points; alternating with the stamens are six shorter and narrower staminodia. The carpels, the female organs of the flower, of which there are several, are situated within the lower part of the perianth.

In the fruit the lower part of the perianth is enlarged, becoming narrowly egg-shaped and measuring over $\frac{1}{2}$ in. in length; it eventually splits on one side and exposes the carpels, which are covered with long brown hairs attaining $\frac{1}{2}$ in. in length.

Flowering period, July; in fruit, November and December.

Distribution.—Confined to Australia. A very common tree in the "scrubs" of the ranges near Killarney, Macpherson Range, National Park, and Upper Nerang River. We have no record of it north of Brisbane. It is found in New South Wales in "scrubs" or "brush," from near the Victorian border on the south to the Queensland border on the north.

Uses.—The timber appears to be used fairly extensively in the Warwick district for general indoor purposes, such as lining, flooring, &c. It is often known there as "Golden Deal." In New South Wales it is also used for lining, flooring, &c. According to Mr. J. H. Maiden, it is rarely touched by white ants, but takes a long time to dry and will not stand glueing.

Chemical.—Dr. J. M. Petrie, Linnean Macleay Fellow in Biochemistry, found that the bark, leaves, and fruit contain an essential oil of a characteristic sassafras odour. The bark contained 1.35 per cent., leaves 4.3 per cent., and fruit 4 per cent. (percentage calculated on material dried at 100 deg.). He also found in the bark, leaves, and fruit a poisonous alkaloid which he named "Doryphorine."

References.—Doryphora sassafras *Endlicher,* "Iconographia Generum Plantarum," tablet 10; Bentham, "Flora Australiensis," vol. v., p. 283; F. M. Bailey, "Queensland Flora," part iv., p. 1295; J. H. Maiden, "Forest Flora of N.S.W.," vol. 1, p. 42, with figure.

Photo. by the authors.]

PLATE 6.—YELLOW SASSAFRAS (*Doryphora sassafras*).
Mountain Ranges East of Emu Vale, near Killarney.

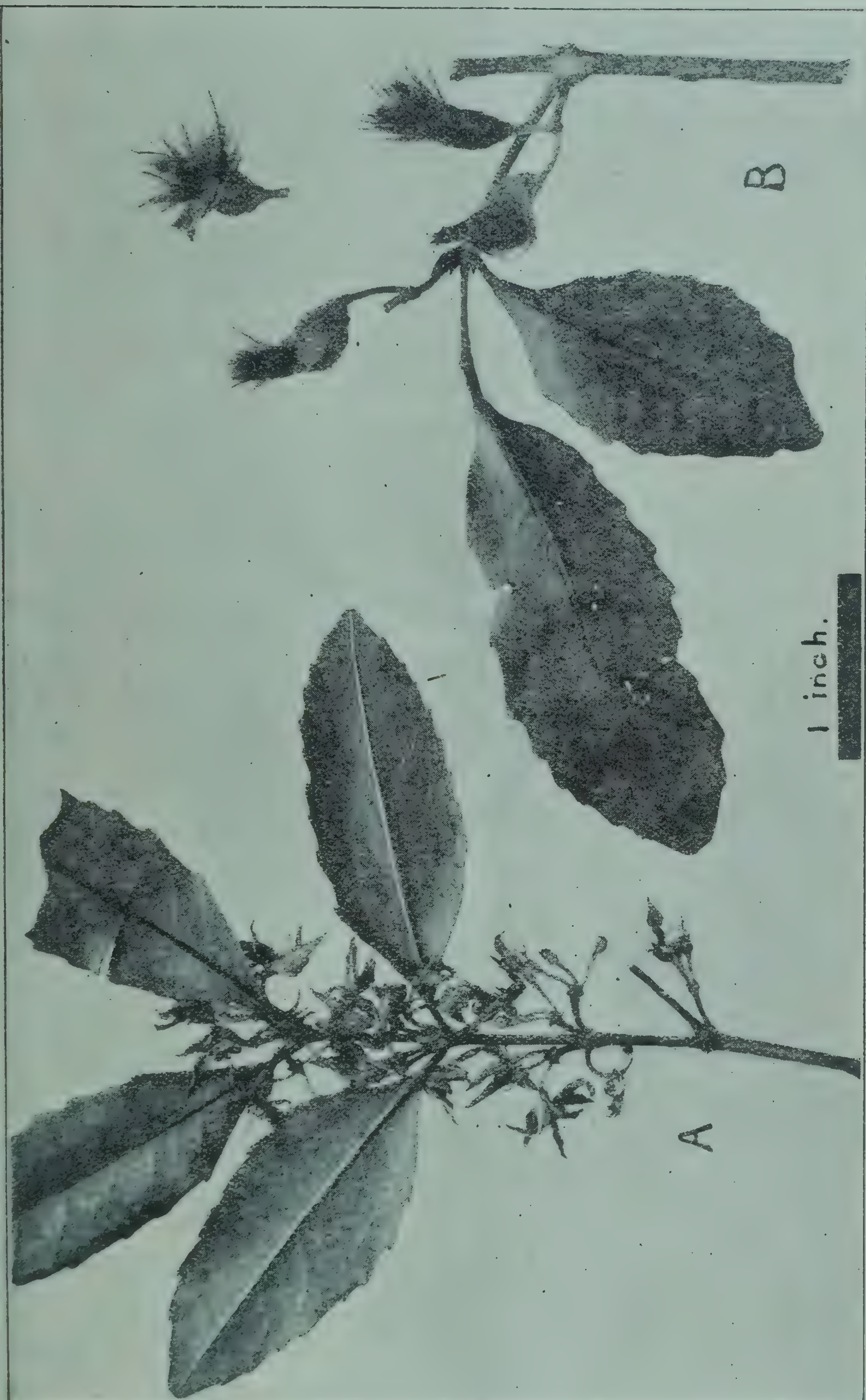


Photo. Dept. Agriculture and Stock.]

PLATE 7.—YELLOW SASSAFRAS (*Doryphora sassafras*).
A.—Flowering shoot. B.—Fruiting shoot.

Entomology.

THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Although much has been published, both of a scientific and popular character, respecting the cane-grub problem, no attempt has, I believe, been made, up to the present, to describe and at the same time illustrate the metamorphosis and external anatomy of our principal cane-beetle, *Lepidoderma* (*Lepidiota*) *albohirtum*, Waterhouse.

The figures on the accompanying plate were drawn and coloured from nature by the writer. The illustration will enable growers to at once distinguish the various life-cycle stages of this pest from those of other closely related but less injurious root-eating Scarabaeidæ associated with sugar-cane, and also obviate any necessity for lengthy technical descriptions that are often objectionable to the average reader.

THE EGG.

In general appearance the egg is obtusely-ovate, creamy-yellow (fig. A), the chorion or shell somewhat coriaceous, finely and irregularly sculptured on the surface, as shown enlarged in fig. B.

When first deposited it is about 4.25 m.m. long by 2.85 m.m. in width, but during development gradually swells, until just prior to hatching it becomes more rounded, darker, sometimes brownish, and may measure fully 6 m.m. in length (nearly a quarter of an inch).

The depth at which these eggs are found depends, naturally, to a great extent upon the amount of moisture in the soil at the time of deposition, which needs to be sufficient to keep them thoroughly damp during a period of at least two weeks.

Practically all of the female specimens confined by the writer in cages of moist earth 5 in. deep at Gordonvale Laboratory (December, 1916) oviposited against the bottom of their cages, where the earth had purposely been made wetter and firmer than that nearer the surface. Had there been more depth of soil, they would probably have gone down a few inches deeper.

Those laying large batches of eggs usually constructed a chamber of irregular shape, from 1 to 1½ in. in length (fig. A), with sides more or less compacted, sufficient room being allowed for the eggs to expand during development.

This cavity generally contained some loose earth, displaced most likely by the beetle whilst crawling from the spot after having oviposited.

The eggs are placed in a flattened mass on the floor of the chamber, and may be produced separately or attached in short strings of two or more, or in adherent groups consisting of as many as seventeen (so far as observed); but as a general rule they are laid singly, and nearly always intermixed with small particles of soil.

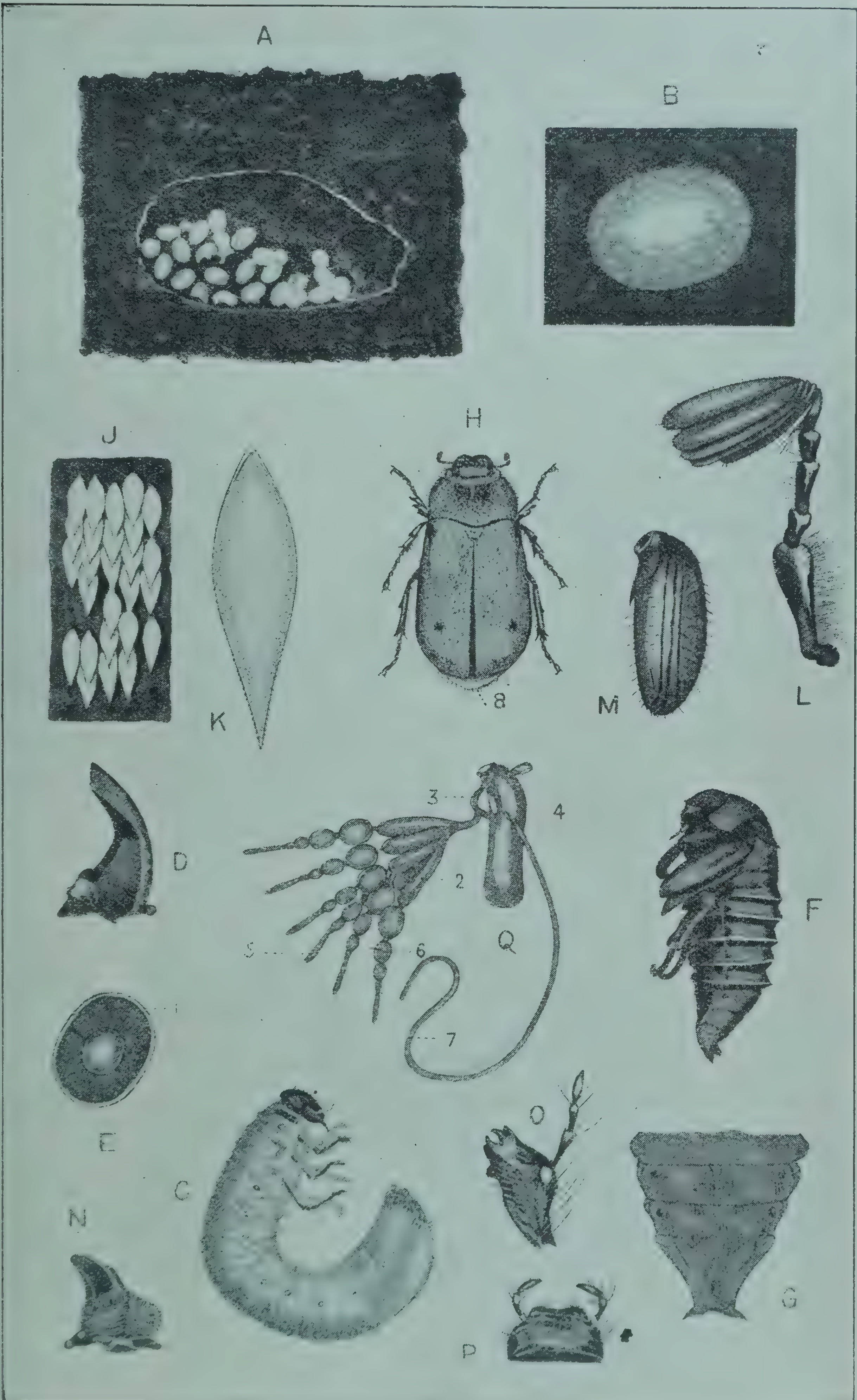
The maximum number derived from one caged female was thirty-six, while other lots, taken from chambers formed in cages of damp earth, comprised eight batches of thirty eggs, three of twenty-nine, one of twenty-eight, one of twenty-seven, seven of twenty-six, three of twenty-five, eight of twenty-four.

The seventy-three females used in the above experiments produced collectively 1,537 eggs (21.5 per insect); but, disregarding specimens laying less than twenty-four eggs, a total of 861 was obtained from thirty-two females, giving an average of about twenty-seven eggs per insect.

When producing twenty or less, the eggs in such lots were generally a little larger at the time of deposition than those taken from chambers containing twenty-five to thirty-six.

Among batches of thirty to thirty-six it was not unusual to find two or three eggs much smaller than the rest.

The two ovaries, one of which is shown in fig. Q, consists of twelve ovarian tubes (Q-2) connected with two oviducts (Q-3), which, together with the long worm-like spermatheca (Q-7), communicate directly with the vagina.



Drawn by Edmund Jarvis.]

PLATE 8.—THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

THE GRUB.

The following brief description of the grub during its third instar (full size) will enable growers to separate it from those of related *scarabaeid* cane beetles.

Description.—General colour creamy-white, bluish, and somewhat translucent just after moulting; the anal segment suffused with dark grey, slatey-blue, or brown, due to the presence and varying colour of the kind of soil ingested. Angular ridges of mandibles black (fig. D); antennæ brownish, five-jointed, the distal ends of same yellow; first joint broadest, about as long as wide; third longest, fourth longer than second, with lower edge of apex produced into a finger-like point; fifth joint about half length of third, with the extremity sub-acute. Stigmata convex, light ochraceous suffused basally with brown, peritreme closed, dark reddish-yellow edged with deeper red, concave, circular near tail end of body (fig. E), and becoming ovate towards head; the spiracle on first thoracic segment largest and usually of irregular oval form. Latero cervical shield light yellow.

Vestiture.—Body clothed with a few rather long light reddish hairs, more plentifully near stigmata and on ventral surface; the ridged elevations of dorsal area of abdominal segments 2 to 6 covered with numerous short very stout brown spines; lower surface of legs thickly clothed with long red spine-like hairs, most abundantly on tibiæ and tarsi; the median path on venter of posterior portion of last abdominal segment consisting of two nearly parallel rows of small stout bristles, about twenty-six on each side, surrounded by longer bristles.[1]

> NOTE.—This disposition of the hairs, &c., can be clearly seen with a simple pocket lens, and, being arranged in different order on the anal segments of the various species, affords one of the best means of separating the grubs of our cane beetles.

Greatest size when fully extended, about 2½ in.; in natural doubled-up position, 1 in. Greatest width ½ in., taken across base of anal segment.

The only other large cane-grubs likely to be confused at first sight with that of *albohirtum* are *Lepidiota frenchi*, Blackb.; *L. consobrinus*, Gir.; and *L. caudata*, Blackb.—all of which, however, are slightly darker, decidedly opaque, and have quite different arrangements of the anal path and surrounding bristles.[2]

When a third stage grub of *albohirtum* is first brought to light in the plough-furrow, it displays a rather curious habit of convulsively doubling its head and thorax, for the space of about half a second, against the ventral surface of the anal segment.

If uninjured by the plough, it often repeats this movement at intervals of about ten seconds during the first minute of exposure, before commencing to bury itself again.

THE PUPA.

A popular description of this stage is given by Tryon in his "Grub Pest of Sugar Cane of the Mackay District."[3]

The pupa of *albohirtum* is about the largest of those occurring commonly in the furrows, full size specimens being 1½ in. long by nearly ¾ wide. The general form and colouration are shown in fig. F; but a brief allusion to the chief points of difference between this pupa and those of closely allied species will serve to throw additional light on this phase of its metamorphosis.

The pupæ of several of our scarabæid cane-beetles were classified for the first time in 1916 by Mr. A. P. Dodd, Assistant Entomologist, whose table of the pupæ in Bulletin No. 6 of this Office will be found helpful. In this "key" the pupæ of *albohirtum* is distinguished by the following characters:—"Size large to medium. Cremaster bearing two sharp spines. Clypeus straight or nearly so. Posterior tarsi distinctly shorter than their tibiæ. Outer edge of anterior tibiæ without teeth; spiracles not raised or prominent. Abdominal segments 3 to 6 ventrally with a small triangular transverse slit with serrated margins, the one on the third segment smaller; ridges of abdominal segments 2 to 6 dorsally acute; longitudinal path of irregular striæ on dorsal segments 7 to 9 of abdomen rather broad, narrowed at base, with about 20 fine striæ at its widest part; medio-dorsal line of abdominal segments 1 to 6 plainly visible."

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[1] Bulletin No. 4, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1. fig. 3, 1916 (see anal path of *L. albohirtum*, Water.).

[2] Bulletin No. 6, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1, figs. 17 and 18, p. 5, 1917 (see illustrations of arrangement of bristles on anal paths of *L. frenchi*, Black., and *L. consobrinus* (No. 683), respectively).

[3] Department of Agriculture and Stock, Brisbane, July, 1895.

These striæ, which I have slightly enlarged at fig. G, appear to be a reliable specific distinction. The very noticeable horn-like processes on the cremaster diverge right and left, and are directed upwards and posteriorly at an angle of about 45 degrees.

The lower portion, two-thirds the length of this horn, is dusky-ochraceous, swollen, cylindrical, and slightly tapering, but thence become suddenly contracted, and terminate in a stout black-pointed spine. In some specimens the surface of this tumid basal portion is wrinkled, exhibiting a series of encircling rings.

The pupa of *L. frenchi*, although somewhat resembling that of *albohirtum*, differs in being much smaller (about 1 in. long), and in the possession of three darkly pointed teeth on the edge of the front tibiæ.

With reference to the situation of the pupa of our "grey-back" cockchafer, most growers are aware that the fully developed grub of this species, after tunnelling downwards vertically beneath a cane stool, constructs an oval chamber measuring about 2 in. by 1 in., in which it pupates.

The walls of this chamber are smooth and firmly compacted, being, according to Tryon, specially lined with the food material and ingested earthy matter contained in the hind segments of these grubs.

In order to ascertain the position of pupæ occurring in volcanic land at Gordonvale, tests were made by the writer during October, 1915, by digging a number of pits 5 ft. square by 2 ft. deep. The first four of these holes contained collectively a beetle, four larvæ, and twenty-three pupæ of *albohirtum;* besides thirty-two grubs of other species of Scarabaeidæ (principally *L. frenchi*) in various stages of growth. No pupal chambers occurred nearer than 1 ft. from the surface, and none deeper than about 15 in., the majority being in soil that was nearly dry.[4]

The occurrence of pupæ at depths of 4, 5, 5½, 6, 12, and 15 in. was recorded by Girault and Dodd in 1915; the lesser depths (from 4 to 5 in.) having been obtained by them from sandy and sandy-loam soils.[5]

Judging by the above records, one might be inclined to imagine that the position of the pupal chamber may not always be determined by varying degrees of moisture in the ground; but it should be borne in mind that, although the occurrence of pupæ in dry situations is by no means uncommon, satisfactory conclusions in this connection are impossible in the absence of exact knowledge regarding the climatic conditions prevailing at the time when the pupal chamber is under construction.

Such great variation in depth (from 4 to 15 in.) must, I think, be attributed to the combined influence of several factors, such as the temperature, moisture, drainage, and mechanical condition of infested lands, operating in conjunction with other agencies influencing the movements of the mature grub; or possibly to the aggression of certain predaceous insect or other enemies chancing to be present in the soil at a time when grubs happen to be tunnelling below to pupate.

The lining or, in reality, puddling of the cell walls would naturally tend to retard evaporation and to some extent lessen the need for absolute dependence on outside moisture.

Tryon was the first to record the interesting fact that grubs of our "Grey-back" cane-beetle usually pupate directly under the stools they have been destroying. "This," he remarks, "is probably the outcome of an instinct for self-preservation—the dryness of the soil often proving fatal to their existence—and an inherited experience that moisture is retained for a long time perpendicularly beneath the cane stool, when it has vanished in great measure from the earth that surrounds it."

It will be seen from the foregoing notes that the pupa of *albohirtum* occupies a position of complete isolation, lying not only at a greater depth than the eggs, but being placed in a specially prepared chamber, with its smooth walls lined in a manner calculated to effectually exclude small insect enemies, and prevent it from drying up or being harmed by heavy rains. This isolation of the pupa proves advantageous also to the beetles themselves, which often have to remain several weeks, occasionally months, in these subterranean chambers while waiting for rain to soften the ground sufficiently to allow them to tunnel to the surface and enter upon their aerial existence.

THE BEETLE.

Description.—Size and general appearance as shown in fig. H. Deep-brown, almost black, more or less thickly covered, except on legs and central area of venter of abdominal segments, with minute, white, sharply-pointed, pear-shaped scales (figs. J, K); not lying in punctures but exposed and readily detachable.

[4] Queensland Agricultural Journal, vol. iv., pt. 6, p. 350, Dec. 1915.

[5] "The Cane Grubs of Australia." Qld. Bureau Sugar Expt. Stations, Division Entomology, Bulletin No. 2, p. 25, 1915.

Freshly emerged specimens are uniformly grey and mealy-looking, but after a few days on the wing become more or less rubbed, these denuded places appearing as irregular black blotches. The scales on elytra of fresh specimens occur most numerously over an area extending about a quarter of an inch on each side of the suture, the central edge or epipleurum being often nearly naked. The pygidium (H. 8) is large, evenly rounded behind, and uniformly but not densely scaled. A small irregular bare patch is usually present on the apical area of each elytron, these two dark spots (indicated in fig. H) being quite a characteristic feature. Just behind each spot lies a small, obtuse, upward projection of the surface of the wing-case, which from this point slopes rather steeply to its apical edge. The sides of the abdomen are thickly covered with scales, which near the costal edge of the elytra are replaced by a mat of finer yellowish-grey decumbent hairs, that cover also the mesonotum and the entire dorsal surface of the propygidium and fifth abdominal segments. Long red bristly hairs occur more or less thickly on the following portions of the body:—Dorsal hind margin of head; outer edges of clypeus, extending ridge-like on frontal portion of eyes; the trophi (figs. N, O, P); anterior edge of prothorax; front margin and upper half of lateral edges of pronotum; legs; centro-ventral area of mesothorax; and posterior edges of pygidium. The form of the antennæ is shown in fig. L, the club being composed of five plates in the male, four in the female; the fifth plate varying in length, and being in some specimens as long as the other four; in others only half the length or even less. The club of female (fig. M) is generally a trifle shorter and more regularly ovate than in the opposite sex. Outer edge of distal end of front tibia with two large bluntly-pointed teeth, and an almost central smaller rather sharp tooth; inner edge provided with a single very stout blunt spine of about the length of first tarsal joint. Intermediate and hind tibiæ with a central tooth and two stout, blunt, curved spurs at distal extremity.

Details respecting the economy and control of this species do not fall within the scope of the present article, but most of our canegrowers are more or less familiar with the principal habits of the adult "Grey-back" beetle, and have collected thousands of specimens from their feeding-trees.

DESCRIPTION OF PLATE.

(Drawn by the Author.)

A—Eggs of "Grey-back" cane-beetle; *in situ*, nat. size.

B—Egg of same, enlarged.

C—Grub of same, third instar, nat. size.

D—Mandible of grub, enlarged.

E—Stigma of same, enlarged; 1, Peritreme.

F—Pupa of "Grey-back" cane-beetle, nat. size.

G—Dorsal view of abdominal segments 7 to 9 of same, showing arrangement of striæ.

H—*Lepidoderma* (*Lepidiota*) *albohirtum*, Waterh.; male, nat. size.

J—Portion of wing-case of same, showing arrangement of scales, enlarged.

K—A single scale, highly magnified.

L—Antenna of same, showing 5-lamellate club, male.

M—Antennal club of female, with 4 lamellæ, enlarged.

N—Mandible of same, enlarged.

O—Maxilla of same, enlarged.

P—Labrum of same (lower lip), enlarged.

Q—An ovary of same, eight days after copulation; 2, ovarian tube; 3, oviduct; 4, copulatory pouch; 5, terminal chamber; 6, immature egg; 7, spermatheca.

THE CANE GRUB.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

Following the deluge of March and April in the Cairns district, we have had almost constant daily showers, keeping the soil in a state of saturation. While this excessive moisture has improved the appearance of dying cane in grubby fields, it has made it very difficult to keep the young plant crop clean. Cane on the forest land, where there is scarcely an indication of grub injury, is making splendid growth, especially the D1135, which is a variety splendidly adapted to the poorer soils. This

cane, however, is unsatisfactory for the rich scrub lands, for the growth is too rank, and the stalks, being so slender, invariably lodge and root to the ground wherever the joints touch. This we have found to be the result in our experimental plots at Greenhills; hence it will be a very troublesome cane to harvest.

The abnormal weather conditions, moreover, have upset our experiments with arsenic, though the fungus disease has caused a real epidemic again among the grubs, the excessive moisture and cool nights being just the conditions required for perfect development of these lowly organisms.

EFFECT OF FLOODING UPON GRUBS AND SUGAR CANE.

During the excessive rains of 1917 I found many apparently lifeless grubs lying about in the water on the surface of the soil. This appealed to me as a possible method of control, so I made some further observations. Much to my surprise, however, the apparently dead grubs soon revived when taken out of the water. Experimenting, I found that it required several days' submergence to really kill them.

Following upon the recent floods, we again took up this phase of the problem. By using pots of soil with one grub in each, and submerging them, we were able to get definite data. These showed that an overflow of one or two days would only destroy the weaklings, while three or four days would begin to have a vital effect even upon the strong, and none of the grubs could withstand an inundation of five days. These conclusions were further borne out by field observations after the soil dried out so that we could dig in it.

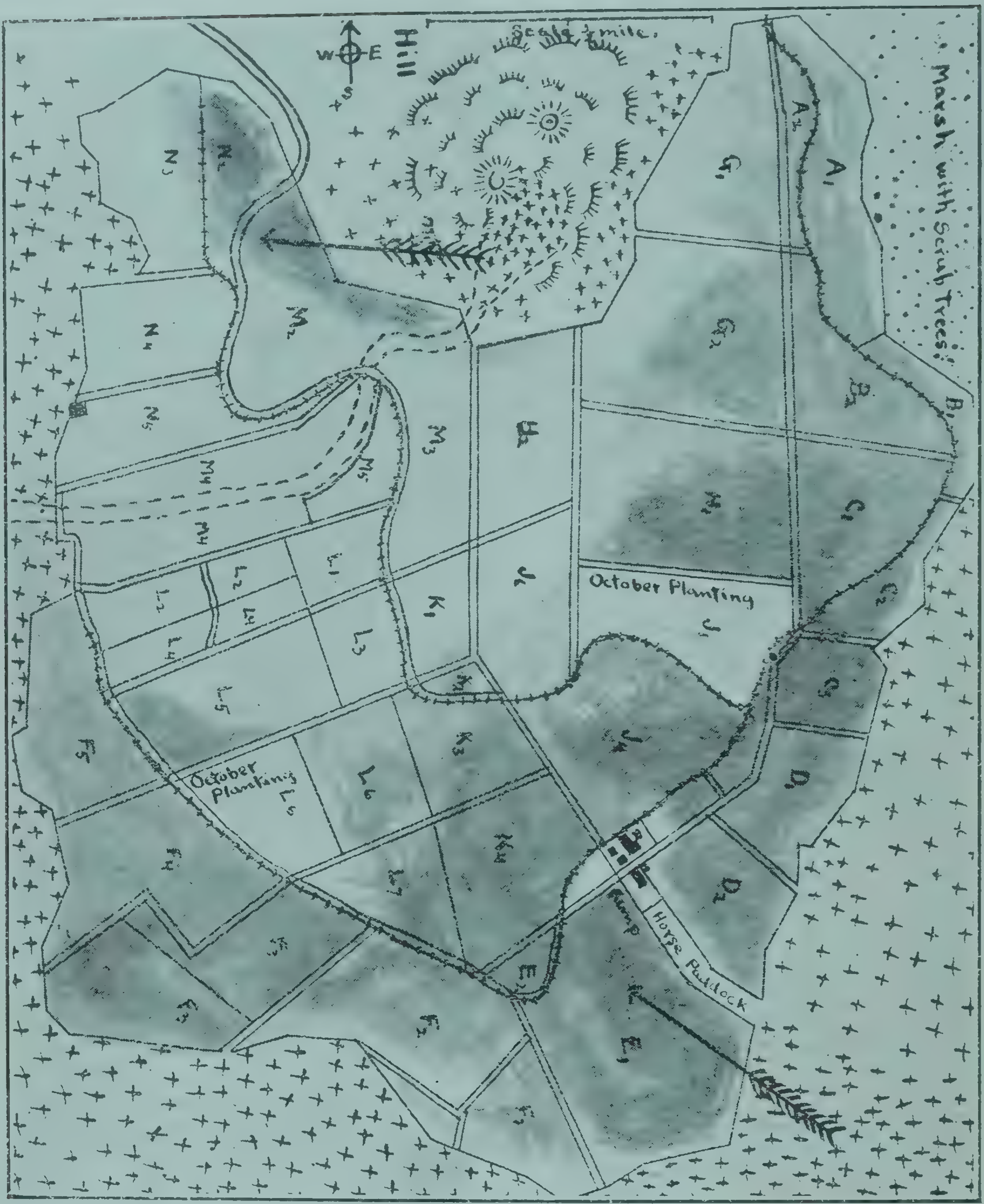
The effects of flooding on the cane, however, were rather disastrous, causing the terminal shoot to rot, probably because of the silt that settles into the soft growing tissues. This results in a growth of the lateral buds, with a loss which may vary from 50 per cent. upward.

GRUB DEVASTATION AND ARSENIC AT GREENHILLS.

The appearance of the cane on this estate is enough to make the strongest heart discouraged. The heavy standover crop, which went flat through the wind during April, is shooting badly at the eyes, so that it will probably deteriorate so much that it will be unfit to mill and hence result in a total loss. The ratoon crops, too, were nipped in the bud, so that they came to nothing. The May, 1920, plant cane, however, though the leaves had mostly dried brown by the action of grubs on the roots, is beginning to recover; new roots are forming, and the terminal shoots are showing green again. This cane, though the stalks were fairly heavy, did not fall much, since it was planted very deeply. It will probably give a fair cut.

There has been much correspondence on the use of arsenic, so I realise how anxiously growers are watching the results of our experiments. I am distressed, therefore, to report that placing the poison in the bottom of the drill with the plants has given no results, no matter what quantity was used, even up to 200 lb. per acre. This may possibly be due to the excessive moisture forcing the grubs to the surface, where they feed on the stalks without getting the poison.

On the other hand, where the arsenic was dusted alongside the young shoots when they were about 12 in. high, in May, 1920, the drills being pretty well filled in, we got results. These were most apparent, however, where the poison had been used at the rate of 200 lb. per acre; cane treated with 100 lb. showed some injury, 80 lb. less, beneficial results being scarcely noticeable where 40 lb. was used. From time to time during the development of the grubs we have removed stools of cane in the various plots to determine the effects of treatment. To review briefly: Examination on 8th February, while the grubs were mostly in the first stage, showed scarcely any difference in the number per stool, whether treated or untreated. On 24th February, however, there was a marked difference, most of the grubs by that time having reached the second or third stage. The first untreated plot that we examined gave fifteen grubs per stool, as has been noted in an earlier report, and there were very evident results in all of the treated plots, most of the larger grubs having been killed by the poison. By 11th March most of the cane in the checks was so badly injured that it fell out of the ground, while the treated plots, particularly the one with 200 lb. arsenic, showed results, though these decreased with the amount of arsenic that had been used. On 11th May we excavated a cubic yard of soil in several plots to determine definitely the effect upon the grubs; in the check plot, where we had found forty-five grubs per stool on 24th February, we were now only able to locate thirteen grubs full grown, and eight of these had been killed by the Metarrhizim fungus; furthermore, powdery green dust was also observed in the soil, where other grubs had disintegrated. Hence this disease had probably destroyed 90 per cent. of them in this check plot; the roots of the plants were entirely eaten away, and even



[*From Bulletin No.* 8, *Division of Entomology.*]

SKETCH OF GREENHILLS ESTATE.

Grub infestation indicated by degree of shading. White, immune area.
Arrows show direction of prevailing winds.
+ + + = Feeding trees of the beetles.
═════ = Roads and headlands.
+ + + + + + = Tramlines.

the stalks gnawed badly. A similar excavation in the plot treated with 200 lb. arsenic disclosed only two large grubs, and these were about a foot away from the drill, where the poison had been applied; the roots in this case were solidly in the ground and almost perfect, being 12 in. or more in length. In the plot treated with 100 lb. arsenic, the results were not so satisfactory; six large grubs were found, one of which had succumbed to the fungus. The roots of the plants, however, were still firmly in the ground, and the cane in fair condition. Since the cane in the plots with less than 100 lb. of arsenic showed little or no improvement over that in the checks, we did not take time to excavate in these.

I think we may conclude from these results that, to be effective, the poison should be placed about the plants near the surface. It is a heavy chemical; hence has a tendency to work downward during cultivation, and with the action of water.

In former years, when the whole of the cultivated ground on the Greenhills Estate was planted to sugar cane, there was a rather well-defined so-called immune area (see sketch); most of the infested fields at that time were along the border, next to the timber, especially on the windward side. Last year, however, for the first time these infested fields (the shaded area on sketch) were thrown out of cultivation. It would appear, now, that this was responsible for the general infestation of the balance of the estate, the beetles being simply compelled to travel further in order to secure suitable conditions for ovipositing.

BEETLE BORER TROUBLESOME.

The publication of the beneficial results from the introduction of parasites of the beetle-borer (*Rhabdocnemis obscura*) at Babinda has brought numerous letters from growers in various parts of the State, some of them even writing from districts outside the range of this pest. The latter, of course, mistook the work of the widely distributed moth borer (*Phragmatiphila truncata*) for it.

Unfortunately, the wet weather has seriously interfered with the continuation of our collection and breeding of the parasites (*Ceromasia sphenophori*), and since I must give up the work before it is completed, let me urge growers, especially in the nearby districts, to make their own arrangements for getting material from Babinda. Since the flies are widely distributed in the whole area south of the mill, especially around Moolaba, it will not be difficult for anyone to secure borer-infested cane, cut up in short lengths, so that it can be put into a bag for shipment. To place this parasitised cane in the borer-infested field, I would advise preparing the soil between the rows, so that each stalk could be covered with about 1 in. of finely pulverised soil. This should be done only in a field which is to stand for two months or more, so as to give the flies a chance to escape, reproduce, and spread into other fields before the cane is cut. Let me also urge, again, the importance of a continuous supply of standing cane in each locality, so that these valuable flies can maintain themselves. Since a generation only requires five weeks, cutting all the cane at one time gives them no chance to find borers; hence the flies naturally die out without being able to reproduce. It is not necessary, however, to leave cane in every field, a small area, every mile or so, is quite sufficient to keep them going in the district. Under normal conditions of harvesting, this need cause no waste, for such cane may be cut late in the season after the other fields have come on again.

THE "FIJI DISEASE" OF SUGAR CANE.

The Bureau of Sugar Experiment Stations has received from the Imperial Bureau of Mycology through the Department of Agriculture, Queensland, the following report of R. J. Haskell, Plant Disease Survey, Washington, D.C.

The name "Fiji Disease" has been applied to this serious malady because it was first reported from the Island of Fiji. Further study of the disease will doubtless lead to a better and more appropriate name.

The disease has been known in Fiji since 1905 at least. Although observed by many people, it has not been thoroughly investigated, and the only published accounts that we have thus far been able to find, by men who have studied the disease first-hand, are those of H. L. Lyon and F. Muir, both of the Hawaiian Sugar Planters' Experiment Station. Their articles are published in the "Hawaiian Planters' Record," a journal that is not widely distributed. An account has also recently been given by Otto A. Reinking ("Diseases of Sugar Cane in the Philippines"—Fiji Disease, "Sugar News," 1: 17-19. Nov. 1920), who used the published matter of Lyon as a basis for his note.

This disease occurs in the Fiji Islands, New Guinea, New South Wales, and has just been discovered in the Island of Mindoro of the Philippine Islands. The disease was found in Fiji by F. Muir in the early part of 1910, and reported on by him ("Ha. Pl. Rec." 3: 197. 1910). It was also reported on from Fiji by H. L. Lyon ("Ha. Pl. Rec." 4: 230-232. 1911), who made a special study of the disease as it occurred in that locality. The disease was reported on from New Guinea by Mr. D. S. North, of the Colonial Sugar Refining Company of Australia, who wrote to Lyon that one of the Sugar Company's men had found the disease to be very prevalent in parts of New Guinea (Lyon, H. L., "Fiji Disease in New Guinea," "Ha. Pl. Rec." 12: 200. 1915) on native cane. In view of this discovery, Lyon expressed the opinion that the original home of the disease was very likely New Guinea, from which place it had spread to Fiji and Australia.

The occurrence of the disease in Australia is indicated by Lyon ("Ha. Pl. Rec." 2: 200. 1915) and has been reported by D. S. North as appearing on experimental plots of New Guinea cane, and by A. H. Haywood ("Agr. Gaz., New So. Wales," Nov. 1920, pp. 773-780) who states that it is now a problem with which growers will have to contend.

The presence of Fiji Disease in Mindoro, Philippine Islands, has been suspected for the last three years. W. H. Weston, of the U.S. Department of Agriculture, in 1919-20 learned of this suspicion from C. W. Hines, of the Bureau of Agriculture at Manilla, and a published note on the possible occurrence of the Fiji disease in Mindoro has appeared in the report of the Pest Control Section of the Bureau of Agriculture ("Phil. Agr. Rev." 12: 93. 1919). During the Christmas vacation (1920-21) Prof. Otto A. Reinking, of the College of Agriculture at Los Banos, went to Mindoro and found the Fiji Disease there doing great damage. According to one of the planters, it was present on the island as early as 1916. Prof. H. A. Lee, of the Bureau of Agriculture at Manilla, reports that Mr. Medalla, his assistant, also visited the island and returned with specimens of the Fiji Disease. Letters from both Reinking and Lee, telling of the discovery, reached Washington at the same time. These are the first authentic reports by pathologists of the presence of the Fiji Disease in the Philippines. Just how widely the disease occurs in the Philippines will have to be determined, but it probably does not occur in Negros, the most important cane-producing island.

IMPORTANCE OF THE DISEASE.

Regarding the seriousness of this trouble, F. Muir ("Ha. Pl. Rec." 2: 197. 1910) writes as follows:—"The worst disease in the Fijian canefields is one known as Fiji Disease. . . . This disease has spread over the whole island, but is worst on the northern side, especially on rich soils. This disease is strongly hereditary; when the stool looks perfectly healthy and the galls are seen only on one stalk, and in very small numbers, every stalk from that root will produce diseased cane if used as seed." Again, H. L. Lyon ("A New Cane Disease Now Epidemic in Fiji" "Ha. Pl. Rec." 2: 205. 1910) writes: "It is certain that the Fiji Disease is one of the most serious diseases yet recorded on sugar cane."

The report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association, 14th October 1911, says ("Ha. Pl. Rec." 5: 323, 1911):—"Dr. Lyon's researches say that the so-called Fiji Disease is the most to be dreaded of all known maladies of the sugar cane." In Mr. Reinking's letter he says:—"The disease is one of the most destructive plant diseases that I have ever observed in the Philippine Islands." In view of the above quotations, and also from other reports on the importance of this disease, it seems that this is one of the most serious of sugar-cane diseases, and one to be feared in sugar areas where the disease does not now occur.

SYMPTOMS.

Mr. F. Muir (l.c.) states that the most constant symptom of the disease, as pointed out to him by Mr. North, of the Sugar Refining Company, is the presence of small galls on the undersides of the leaves and in the softer tissues of the cane tops, sometimes extending a long way down the stalk. A more noticeable character is the dying of the tops and the growth of lateral branches, the tops of which also sometimes die, and, in turn, give off lateral growths.

H. L. Lyon ("Ha. Pl. Rec." 4: 300. 1911) describes the disease as follows:—"The most conspicuous symptom of Fiji Disease to be noted in the field is the shortening and crumpling of the last leaves to unfold from the spindle. This peculiarity will attract the attention when one is still a considerable distance from the affected cane. The shoot may have attained considerable length and be clothed with many healthy-looking leaves of the usual length and colour, but all of a sudden it loses the power to produce normal leaves, throws out a few bent and twisted stems, and then ceases to grow altogether. Some of the eyes may start, but the resulting 'lalas' soon repeat the antics of the main stem. The stalk may remain alive for months, or it may die soon." He also mentions the characteristic galls usually to be found on most of the healthy-looking leaves and on all of the deformed and blighted ones. The appearance of these galls is the first outward symptom by which the disease may be detected, but the cane may be infected for months before any galls appear. In other words, the galls mark a well-advanced stage of the disease. According to Lyon's photographs, affected plants are very much stunted and dwarfed and die early.

CAUSE.

The Fiji Disease is apparently caused by a Myxomycete somewhat similar to *Plasmodiophora brassicae*, the cause of the club root of cabbage. A study of the etiology of the disease was made by H. L. Lyon, and a preliminary report given out by him ("Ha. Pl. Rec." 3: 200-205. 1910). Lyon found what appeared to be the plasmodium of an organism in the cells of the leaf galls, but apparently has not proved the pathogenicity of such organism. He thinks that the swarm spores may gain entrance to the cane tissue by penetrating the roots and then following up the vascular bundles to the leaves. He also thinks that the organism can live over in the the soil for a considerable length of time, as does the organism of club root of cabbage. Plants grown from cuttings taken from diseased cane are sure to be infected. The organism is also readily carried from field to field by the transfer of bits of trash.

VARIETAL SUSCEPTIBILITY.

According to Lyon and Muir the disease shows marked differences in varietal susceptibility in Fiji and New Guinea. On account of this fact, and because of the danger of the appearance of the disease in Hawaii, the Hawaiian Sugar Planters' Experiment Station sent a large number of cuttings of various Hawaiian varieties to Fiji to be propagated there, and to ascertain their relative resistance to the Fiji disease.

AUGUST SHOW DATES.

Lower Burdekin P.A.I.A., Ayr: 5th and 6th August.
National A.I.A., Brisbane: 8th to 13th August.
Bowen P.A.M.A., Bowen: 10th and 11th August.
Belmont A.H.I.S., Belmont: 20th ugust.
Horticultural Society of Queensland, Brisbane: 20th August.
Herbert River P.A.A., Ingham: 26th and 27th August.
Balmoral District H.I.S., Balmoral: 27th August.

ACKNOWLEDGMENT.

In the June Journal, p. 247, we reproduced a plate depicting a new parasite on sheep maggot flies to illustrate Professor T. Harvey Johnston's paper on "The Sheep Maggot Fly Problem in Queensland." The plate was taken from an article in a previous issue of this Journal by Mr. Walter W. Froggatt, F.L.S., Government Entomologist of N.S.W., and to whom we are indebted.

General Notes.

DESTRUCTION OF PRICKLY-PEAR BY MEANS OF ARSENICAL POISON.

By J. C. BRUNNICH, Chemist to the Department of Agriculture and Stock.

Scattered plants of prickly-pear are best destroyed by *injecting* the poison. This may be done by means of any of the powder or liquid injectors, or by making a longitudinal incision in the second or third ''leaf'' of the plant and placing therein either about a teaspoonful of the dry powder (*a*), or a wineglassful of the concentrated solution of the poison (*b*).

With small plants one injection is generally sufficient, but with larger plants two or more ''leaves'' may have to be treated.

Large clumps of pear consisting of many plants, and denser pear generally, may be more economically destroyed by first lightly *spraying* with the diluted spraying solution (*c*), then mutilating or slashing the pear with billhooks, spudbars, or any suitable mechanical contrivance, and then again spraying.

In any case it is advisable to burn off the poisoned pear as soon as it has become dry enough to burn readily, as this operation destroys most of the young growth of seedlings, &c., which is usually found under the clumps, and which is often not destroyed by the poison.

The mixtures are prepared as follows:—

(*a*) DRY POWDER FOR INJECTION.

Take—

Fifteen (15) pounds of common salt,

Ten (10) pounds of arsenic,

Four (4) pounds of caustic soda,

and mix these ingredients thoroughly. All the ingredients should be in powder. The mixture must be kept in air-tight tins or packages, otherwise it absorbs moisture from the air, and is inclined to set into a hard lump.

(*b*) CONCENTRATED SOLUTION FOR INJECTION.

The mxture of the dry powder (*a*) consisting of 15 lb. of common salt, 10 lb. of arsenic, and 4 lb. of caustic soda, is placed in a suitable vessel, and to it is added slowly and carefully, with constant stirring, cold water until the total volume is eight (8) gallons.

Should it be found that all the arsenic has not dissolved (which is shown by the fact that it appears as a sediment on the bottom of the vessel), it will be necessary to boil the mixture for a few minutes.

Certain brands of arsenic are more readily soluble than others, and we found ''Red Rose'' arsenic to be the most readily soluble of many tested.

(*c*) DILUTED SOLUTION FOR SPRAYING.

To eight (8) gallons of the concentrate (*b*) add cold water until the total volume of the solution is one hundred (100) gallons.

This strength of solution is the weakest which can be used economically for spraying, and at certain seasons it may be necessary to use the spraying solution somewhat stronger.

The addition of saltpetre, copper sulphate, or other compounds to the spraying liquid cannot be recommended. They are either useless or worse than useless.

On account of the highly poisonous nature of all arsenical compounds, great care must be taken in the preparation of the solutions, and, particularly, the vapours of the boiling solutions and the spray-laden atmosphere (when spraying) should never be inhaled. To prevent possible absorption of the poison through the skin, it is advisable always to rub vaseline or other grease on the hands and arms before commencing operations. There is, however, little danger if reasonable care is exercised.

Cattle must be kept off country on which pear is being poisoned either by spraying or by injection. The grass will generally grow again after a few weeks in favourable seasons, and cattle may then be allowed to graze with safety on the treated area.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom). In the May number R. C. Punnett, F.R.S. (Professor of Genetics, University of Cambridge) continues an interesting review of results of research in animal breeding, and discusses further simple Mendelian inheritance in respect to coat colours in cattle. ''Pollination in Fruits'' is another leading feature. Another phase of agricultural education is covered by a paper on ''Rural Bias'' in Secondary Schools, which, incidentally, describes the work at Sexey's Foundation School in Somerset. ''It does not,'' says the author, ''require any special gift of vision to see in secondary schools with a 'rural bias' a prospect that may go far to change the outlook of those who work on the land. . . . It is admitted on all sides that no class of our population has done better work for the country or has received less return for it in years past than the agricultural labourer.''

The Journal of Agricultural Research (U.S.A.) for April contains a very informative leading article on ''Observations on the Body Temperature of Dry Cows.''

The Agricultural Gazette of Canada (March-April) has among its leading topics a survey of ''The Financial Benefit of the Work of the Department of Agriculture.'' A paper on ''Marketing and Distribution of Fruit'' contains a plea for closer co-operation and co-ordination among growers. Agricultural education in secondary schools is also discussed.

The International Review of the Science and Practice of Agriculture (Rome) for February covers much general agricultural intelligence. An original article on '' The Rearing of Donkeys and Their Crosses with Horses in Italy and her Colonies'' by Professor Mascheroni (Royal Higher School of Veterinary Medicine, Turin) is of special interest to stock breeders.

The Agricultural Journal of India (March) has an interesting note on ''Prickly Pear as Fodder for Milch Cattle,'' containing the information that in India prickly-pear is used as cattle food during famine periods. ''The cactus is roasted over a village forge and chopped fine before being given to the cattle in combination with *kaabi* (dry sorghum stalks) or cotton seed. . . . In reviewing the work Lieut. Col. G. K. Walker, Superintendent, Civil Veterinary Department, Bombay, remarked that 'there can be no doubt that cattle can be maintained on prickly-pear, when necessary, without harm.' It, however, appears from the following extract from the Journal of the Department of Agriculture, Union of South Africa (Vol. 1, No. 9), that prickly-pear is not merely an emergency fodder, but is considered a valuable foodstuff for milch cattle, which increases 'the quantity while maintaining the quality of the milk.' In Corsica and Sardinia a daily ration of about 50 or 60 lb. per cow, comprising prickly-pear finely cut up, mixed with bran or dry grass, was fed to impoverished cows, which had almost ceased their supplies, with good results. . . . In Mexico, milch cows maintained their yields, in spite of increasing coldness of season, when fed on prickly-pear.''

The Rhodesia Agricultural Journal (April) features a lengthy report on ''The Citrus Industry of California,'' which strongly emphasises the now generally accepted necessity of growers marketing a standard commercial article, keeping to a standard pack of consistently good quality; and sets out the essentials of success in this highly specialised branch of agriculture as (1) the production of the right class of fruit, (2) close attention to trees, (3) the use of every precaution known to be of value in picking, packing, railing, and shipping, (4) quick action at the right moment at the business end of operations, and (5) advertising propaganda.

Agricultural Gazette of New South Wales (June) contains full particulars of the remarkable milk and butter record of Melba XV. of Darbalara, a deep red, well-framed cow, showing good constitution and of the Milking Shorthorn type. Her official record for 365 days is: Milk produced, 21,635.5 lb.; butter fat, 954.472 lb.; estimated quantity of commercial butter, 1,149.966 lb.

Answers to Correspondents.

SISAL HEMP.

"J. A. C." (Beerburrum).—Your letter was referred to the authority named by you, who advises that it would be unwise, under existing marketing conditions, to devote any time to the culture of sisal hemp.

SEVILLE ORANGES.

J. T. ROWTHAN (Milton).—Your citrus samples are ordinary good commercial Sevilles suitable for preserving purposes. Their skins are bright and very clean. The land on which they were grown—sandy loam naturally drained (Park Ridge, Kingston)—is, according to your description, well suited for citrus culture.

CAROB AND ALGAROBA BEANS.

A Toowoomba correspondent notifies us that seeds of the carob or locust (*Ceratonia siliqua*) may be obtained from the Curator, Botanic Gardens, Toowoomba, where an old tree of this species bears fairly freely. The seed germinates readily if soaked in water for about a day before sowing. Our correspondent raised a few seedlings from this tree last year.

Another correspondent—W. Brotherton, of "Brotherton," Gladstone—states that his Algaroba tree shed all its pods in May, and at the time of writing (6th June) was a mass of blossoms. It is a *Prosopis juliflora*. He is willing to supply seeds at a nominal price to cover incidental cost.

RATS, MATCHES, AND FIRES.

W. A. NOBLE, Toowoomba, writes:—"Being especially interested in the subject of rats and matches now under discussion in your Journal, may I give my experience? Some time since, my buggy was brought into the coach-house during the evening and, inadvertently, a box of wax matches was left on the leather-covered cushion. In the morning I found the box lid had been nibbled through and the charred remains of the box and a number of burnt matches lying on the cushion which was also charred to the extent of about a 3-in. circle. Lying on the floor of the buggy also were several matches that had been nibbled but not ignited. The fact that in the building were bags of maize, also bran and pollard, proves to my mind that rats do chew matches and are very fond of them when accessible. Since the discovery I have not allowed wax matches into my house unless when kept in tin boxes."

TO PICKLE OLIVES.

INQUIRER (Bulimba).—Make a brine with coarse salt and a small piece of saltpetre (the size of a nut) of strength sufficient to float an egg. Place the olives selected, half ripe or ripe of full colour, in a jar. Pour in the brine to cover olives, keep them entirely immersed in the solution, and let them stand for from 4 to 6 weeks. Then pour off brine and replace with half strength solution for about 2 weeks, and then with quarter strength for, say, a similar period. Wash before serving.

Another method:—Select half ripened or full ripened olives. Wash and place in jar (glass for preference) in layers covered by coarse salt. The olives may be pricked with a needle beforehand. When jar is filled with alternate layers of fruit and salt, top with salt and let stand until it liquefies and becomes wine coloured. This takes from 3 to 4 weeks. Then wash olives and replace in weak brine or water, and let stand until required for table. Wash before serving.

Another recipe:—Pick olives when turning from green to ripened colour, though ripe fruit may also be used. Cover for the first time with a solution containing 2 oz. caustic soda and 3 oz. salt to each gallon of water, and allow to stand for 24 hours. Then change solution to 3 oz. salt to 1 gallon of water for 24 hours. Then, in order, 4, 5, 6, and 8 oz. to gallon, keeping each solution in use for 48 hours or longer. After the last immersion, pickling is complete. Olives must be kept entirely immersed at all times.

The Markets.

PRODUCTION AND MARKETS.

The following survey is an abridgment of weekly departmental summaries of conditions, prospects, and prices (21-6-21).

AGRICULTURE.

Early in June, fairly widely distributed rainfalls were reported from the Southern Coastal districts. The Downs also reported good falls. Goondiwindi had 2¼ inches, and Allora, Inglewood, and Dalby each over 1 inch. Several other registrations, ranging from 20 to 90 points, were reported. Only light precipitation was recorded in the Lockyer; Laidley with 86 points being the most fortunate. The Boonah district had only 55 points for the first week of the month. Light frosts were reported in some localities.

The formation of a Canary Seed Pool is expected to generate a more active spirit of co-operation among growers.

Good accounts of the new maize harvester, invented by Mr. George Free, of Nobby, which is capable of harvesting, threshing, and bagging maize direct from the standing crop, continue to be received.

Heavy supplies of maize had the effect of keeping prices reduced. Lucerne and oaten chaff was plentiful, but the demand was light. Potatoes were marketed in large quantities to an improved demand. Broom millet was not plentiful, and production generally appears to be light this season. The price of prime hurl remained at the same figure; other qualities declined £2 per ton.

In the second week of June exceptionally heavy rains were almost State wide in precipitation. All the Southern Queensland agricultural areas were favoured, floods occurring in many localities. Many of the farms on the Barambah Creek frontages in the Murgon district (South Burnett) were more or less inundated, a considerable crop loss resulting. Heavy losses of maize and potatoes were reported. The North Coast district, where previously heavy rains had fallen, suffered much in this respect. Part of the Goondiwindi country was flooded, but, owing to dry conditions previously prevailing, not much wheat had been planted, otherwise crop losses would have been more serious.

In many districts, particularly the Lockyer, Downs, and Boonah regions, the winter rains proved timely and of immense benefit. The general seasonal outlook is most promising. The season to date has been very mild in temperature, and should the localities which have been eaten bare escape frosts for the next few weeks, young grass and herbage will make good headway. Deliveries of cotton continue at the departmental ginnery, Brisbane, which is in active operation. Maize supplies were light, probably due to the heavy conditions of country roads. Potatoes sold to 6s. 6d., with supplies plentiful and demand fair. Lucerne chaff was plentiful and topped at 10s. 6d. Supplies of oaten chaff were fair. Pumpkins and sweet potatoes were fairly plentiful. Only one line of barley was offered. Brown Millet supplies improved. Prime hurl sold to £26.

For the week ended 21st June, the weather was fine generally. Scattered showers were reported. The heavy rains of the previous week were generally most beneficial, and reports from agricultural and pastoral areas were most encouraging. Maize supplies were light, but improved as the week advanced. The price, 4s. 1d., was better. Lucerne chaff came forward heavily and sold to 9s. Oaten chaff consignments were fair. Potatoes were plentiful. Most of the pumpkin lines were passed in. No sales of skinless barley were made.

DAIRYING.

Production is shrinking gradually, in keeping with seasonal conditions.

For three weeks ended 21st June, 26,934 boxes of butter (each 56 lb.) and 137 crates of cheese (each 142 lb.) were graded. Dairy produce in cold store (18-6-21) was 16,193 boxes butter and 43 crates cheese. 14,886 boxes butter were shipped oversea, and 14,846 boxes butter and 20 crates cheese were shipped interstate.

FRUIT AND VEGETABLES.

Mild spring-like conditions produced a heavy growth of vegetables. Strawberries are yielding very heavily. Pineapples and bananas continued to make growth, and excellent pines reached the market. Southern prices for bananas were very satisfac-

tory. Citrus fruits came forward in much better quality, and practically free from fly. The heavy mid-month downpour proved most beneficial, soil and subsoil receiving a thorough soaking. The rain, accompanied by warm weather for the time of the year, has produced very vigorous growth in all crops. The good growing conditions favoured the development of Irish blight, and tomatoes were somewhat affected. Mango trees in blossom in the Brisbane district show evidence of extraordinary seasonal mildness. If the blossom sets, an exceptionally early crop may be expected. Pawpaws are ripening fast, and custard apples are in good supply.

FAT STOCK.

Prime bullock beef realised from 20s. to 30s., and cow beef from 15s. to 27s. Prime mutton reached 4½d.; good trade mutton ranged from 2¾d. to 4d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MAY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Re-cords.	May, 1921.	May, 1920.
North Coast.	In.		In.	In.
Atherton	2·22	20	2·53	2·84
Cairns	4·71	39	6·50	11·78
Cardwell	3·78	49	6·51	11·36
Cooktown	3·20	45	2·18	12·68
Herberton	1·76	34	2·92	4·62
Ingham	3·75	29	4·20	12·07
Innisfail	12·98	40	16·87	29·58
Mossman	3·39	13	5·41	15·56
Townsville	1·42	50	2·05	5·27
Central Coast.				
Ayr	1·27	34	1·45	5·57
Bowen	1·41	50	0·99	4·48
Charters Towers ...	0·85	39	1·30	3·34
Mackay	4·05	50	1·41	7·47
Proserpine	5·45	18	5·44	7·89
St. Lawrence ...	1·93	50	1·61	4·19
South Coast.				
Biggenden	1·92	22	2·73	1·39
Bundaberg	2·84	38	2·04	3·01
Brisbane	2·89	70	0·76	2·02
Childers	2·41	26	2·62	2·89
Crohamhurst ...	5·00	25	3·91	5·18
Esk	2·20	34	0·92	2·41
Gayndah	1·61	50	2·63	1·86
Gympie	3·10	51	1·59	1·79
Glasshouse M'tains	3·86	13	..	3·26
Kilkivan	2·02	42	1·18	2·41
Maryborough ...	3·17	50	1·96	3·61

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Re-cords.	May, 1921	May, 1920.
South Coast—continued:	In.		In.	In.
Nambour	5·15	25	3·78	2·69
Nanango	1·67	39	1·31	1·82
Rockhampton ...	1·64	34	1·25	1·94
Woodford	3·07	34	2·34	3·80
Darling Downs.				
Dalby	1·37	51	1·96	1·95
Emu Vale	1·28	25	0·98	2·32
Jimbour	1·26	33	1·47	1·57
Miles	1·62	36	1·31	0·52
Stanthorpe ...	1·99	48	3·05	2·20
Toowoomba ...	2·38	49	1·23	3·48
Warwick	1·69	34	0·88	2·19
Maranoa.				
Roma	1·52	47	0·59	0·35
State Farms, &c.				
Bungeworgorai ...	0·78	7	0·53	0·95
Gatton College ...	1·95	22	1·17	3·26
Gindie	1·13	22	1·44	0·57
Hermitage ...	1·45	15	1·06	2·44
Kairi	2·35	7	3·50	3·76
Sugar Experiment Station, Mackay	3·81	24	1·76	7·87
Warren	1·46	7	0·94	4·61

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good, sound seed that has sprouted. Preventive measures should be taken to spray young and growing crops to check Irish blight, using "Bordeaux" or "Burgundy" mixtures. Full particulars on this subject are obtainable on application to the Department of Agriculture. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop.

Sow pumpkins. Swede turnips and lucerne may still be sown in temperate districts, but they will have to contend with weeds which will begin to vigorously assert themselves as the weather gets warmer; therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case also it is advisable to avoid too frequent planting of cuttings from the old vines, and to obtain cuttings from other districts or raise "shoots" n a hotbed from tubers selected from heavy yielding plants. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn out sugar lands in the Central and Northern districts if not intended to be manured and replanted will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Orange-trees will be in blossom, and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

August is to be regarded as a period for activity in all matters appertaining to cultivation.

In the coastal districts plant life becomes active earlier than in other and more temperate parts of the State, consequently judgment should be used in respect to the planting and sowing of seasonable crops in keeping with local conditions. Vegetable growers in favoured localities should make every effort to cater for the early market trade and endeavour to obtain enhanced prices for their produce. Succession sowings are advisable to keep up a continuity of supplies throughout the season. Special attention should be paid, however, to the spraying of crops to check the insidious attacks of insects, which are more prevalent in mild seasons like the present one.

Success in all matters connected with crop production depends largely on the thorough preparation and manuring or fertilising of the land beforehand to bring it into the best possible tilth for planting. This is very necessary when artificial supplies of water are limited.

Crops of all kinds which establish themselves in the cooler part of the season and have the opportunity of developing a good root system will produce in greater abundance.

Mulching, by means of well-rotted farmyard manure, will do much towards the retention of moisture in the soil, by checking evaporation. Where supplies are not available, the constant stirring and movement of the surface soil by cultivation may be substituted.

Orchard Notes for August.

THE COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of Citrus Fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where Winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, pawpaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. Just as the buds of the vine begin to swell, but before they burst, all varieties should be dressed with the sulphuric acid solution—viz., three-quarters of a pint of commercial sulphuric

acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid. This is the winter treatment for the prevention of anthracnose or black spot, and for downy mildew, and should on no account be neglected.

Fruit-fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit-flies early in the season is the surest way of checking this serious pest.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the granite belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear, or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphis, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphis should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the warmer parts of these districts the pruning of grape vines should be completed, and they should receive their winter dressing for black spot and downy mildew, as recommended for the coast. In the granite belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

SUSPECTED POISON WEED IDENTIFIED.

A specimen forwarded by the Prisons Department is identified by Mr. C. T. White, F.L.S., Government Botanist, as *Stachys Arvensis*, a weed variously known as Stagger Weed, Sweet Nettle, Hedge Nettle, Wild Mint, &c.

It is one of those plants about which there is some doubt as to its qualities. It is looked upon almost universally by stockmen in Australia as a plant causing "shivers" or "staggers" in horses, working bullocks, and travelling stock, but is almost or quite harmless to resting stock such as milking cows and calves. This is very remarkable, as the weed is common in Europe and America, but no bad reports are heard of it from those countries.

However, quite recently a closely allied plant (*Lamium amplexicaule*) has been shown to be able to produce "staggers" or "shivers" in travelling or working stock, so it is more than likely that the popular belief regarding *Stachys Arvensis* is founded on fact.

Stock suffering from shivers or staggers usually recover if rested and taken off paddocks containing the plant responsible for the mischief.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	May.		June.		July.		August.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5·6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5·9	6·19	5·25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6·37	5·0	6·37	5·10	6·17	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·29
26	6·28	5·2	6·39	5·2	6·34	5·15	6·9	5·30
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·39	5·2	6·33	5·16	6·7	5·31
29	6·29	5·1	6·39	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6·39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H. M.
8 May.	●	New Moon	7 2 a.m.
15 ,,	☾	First Quarter	1 25 a.m.
22 ,,	○	Full Moon	6 15 a.m.
30 ,,	☽	Last Quarter	7 45 a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4 14 p.m.
13 ,,	☾	First Quarter	7 0 a.m.
20 ,,	○	Full Moon	7 41 p.m.
28 ,,	☽	Last Quarter	11 17 p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11 36 p.m.
12 ,,	☾	First Quarter	2 16 p.m.
20 ,,	○	Full Moon	10 8 a.m.
28 ,,	☽	Last Quarter	12 20 p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6 17 a.m.
11 ,,	☾	First Quarter	12 14 a.m.
19 ,,	○	Full Moon	1 28 a.m.
26 ,,	☽	Last Quarter	10 51 p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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BIOLOGICAL CONTROL OF THE PRICKLY-PEAR PEST.

By Professor T. HARVEY JOHNSTON, Scientific Controller, Commonwealth Prickly-pear Investigations.

It was stated a few years ago that the estimated area of prickly-pear infested land in Eastern Australia was over 22,000,000 acres, about 20,000,000 being in this State and the remainder in New South Wales. It was pointed out that this area was one-third more than the total area under crops (including fruits of all kinds) in the whole of Australia, and that this immense total was being increased at the rate of about 1,000,000 acres annually in Queensland alone.(1)

Attempts have been made to control the pest by legislation; by mechanical methods; by chemical means; and, to a very slight extent, by biological agencies. Of these, the most effective, so far, has been the chemical method, which has been thoroughly tested in this State, especially by Mr. Brünnich and Dr. White-Haney.(2) It is known that certain combinations of arsenic are highly poisonous when applied in the form of a gas or vapour, as injections, or as sprays; but the cost of labour and material is commonly too great for these chemical methods to be economical, since the expense incurred in clearing infested land is very frequently greater than the value of such land when cleared. Even if an area be once freed from prickly-pear by such means, a considerable amount of time and money must be expended each year if such land is to be preserved from fresh infestation.

The biological method of attacking the problem, which has not yet been given a fair trial, necessitates a study of the plants themselves, and especially of the various natural enemies known to infest prickly-pear and other cactus plants in various parts of the world. Many such enemies are now known to occur, some of them being insects; others are fungi, and others are bacteria. Amongst the insects are included several kinds of moths which in their caterpillar stage bore into and feed upon the plant tissues; certain beetles, such as the cactus longicorns and weevils; cactus bugs

(1) "The Prickly Pear in Australia," by W. B. Alexander. Bulletin 12, Institute of Science and Industry, 1919.

(2) "Reports of the Prickly Pear Experimental Station, Dulacca," by Dr. Jean White-Haney—In Ann. Reports, Dept. Lands, Queensland, for 1912, 1913, 1914, 1915.

and the various forms of cochineal insects; sundry species of flies, including the cactus midges and many kinds of scavengers whose larvæ live in and assist in destroying injured and diseased plant tissues.

The Queensland Government in 1912 appointed a Travelling Commission, consisting of Mr. Henry Tryon (Government Entomologist) and the writer, to visit various countries of the world, in which prickly-pear plants occur either indigenously or in a naturalised state, in order to study the possibility of utilising biological means for the subjugation of the pest. As a result of its inquiry, the Commission recommended that certain of these enemies, known to be restricted to cactaceous plants, should be introduced, and their efficacy tested in Australia.(3)

Certain of these were actually sent or brought from abroad by the Commission, viz.:—the true cochineal, *Coccus cacti* (*Dactylopius coccus*), and one kind of wild cochineal, *Coccus capensis*, both from Cape Colony; another kind of wild cochineal, *Coccus indicus*, from Ceylon and from Northern India; a moth borer, *Zophodia cactorum*, from the Argentine Republic; and a fungus disease, "Shot hole" or Anthracnose, caused by *Glœosporium lunatum*. Only two of these agents became established in Queensland—viz., *Coccus indicus* and *Coccus capensis* (4)—both of which, unfortunately, restrict their attentions to one kind of prickly-pear, *Opuntia monacantha*, the attack by *C. indicus* being particularly injurious to that plant. In fact, the introduction of this insect has been so successful that the "*Monacantha*" pear has been practically eliminated in all districts where the wild cochineal has been able to obtain access to it. Instead of adapting itself to other kinds of cactaceous plants naturalised in Queensland, the organism, after destroying its favourite food-plant, dies. As this particular kind of insect attacks a species of prickly-pear native to certain parts of South America, Southern Brazil, and the adjacent parts of Argentine and Uruguay, and does not infest any of the other species naturalised in our continent—species whose original homes are Mexico, West Indies, and the neighbouring coasts of U.S.A.—it is reasonable to assume that the native home of the insect may be some South American locality. In fact, one species has been described under the name of *Coccus argentinus*, from the Argentine, where the writer has seen it infesting various species of cacti. It is not unlikely that the two names may be synonymous. It is known in animal parasitology that when a host animal and its parasite are imperfectly adapted to each other the latter may sometimes produce effects so virulent as to destroy the host, whereas related parasites may cause comparatively little inconvenience. It is, then, possible that *Coccus indicus* may not be a normal parasite of *Opuntia monacantha*, but may infest some other South American species of prickly-pears and cause much less damage than that noted as having been brought about in India, Ceylon, South Africa and Queensland by the attacks of this insect on "*monacantha*" pear.

The success which attended this introduction led the Commonwealth Institute of Science and Industry to approach the Governments of the Commonwealth, New South Wales and Queensland with a request that funds be set aside to allow the other biological recommendations of the Travelling Commission to be tested in accordance with a scheme of investigation drawn up by the Institute. The war hindered the progress of negotiations, but eventually co-operation was secured, and the writer was asked to undertake control of the scientific side of the investigation.

The scheme came into operation officially in June, 1920; and a visit was made to North and South America, assistants selected for the work in those two continents, and all arrangements made in regard to laboratory accommodation and assistance in the various centres proposed to be explored, as well as for the collection and transit of desired material, &c.

Some natural enemies were brought across from South America by the writer, the chief being two disease-producing fungi (*Sclerotinia cactacearum*, *Montagnella opuntiarum*), and a certain species of Syrphid fly which breeds in great numbers in injured or diseased prickly-pear joints and brings about their rapid destruction. Unfortunately, the flies which bred out readily from the larvæ that were imported, failed to breed, and, having now all died, the introduction has not led to their establishment in this continent. The fungi are being experimented with under laboratory conditions. Both of them are very important prickly-pear destroyers in Argentina, from the Andes to the Atlantic Coast.

Recently a consignment of cactus insects and disease-producing germs (both fungoid and bacterial) arrived from Southern Florida and Texas, chiefly from the former locality, where they were collected or bred by one of the writer's staff (Mr. J. C. Hamlin). Included in the collection were the following organisms:—(1)

(3) "Report of the Prickly Pear Travelling Commission, 1912-1914," by T. Harvey Johnston and Henry Tryon. Parliamentary Report, 1914.

(4) Dr. White-Haney. *l.c.*, 1914 (1915) and 1915 (1916). T. H. Johnston, Proc. Royal Soc Queensland, 1916, pages 22-25.

Cactus moth-borers (*Melitara prodenialis*); (2) cactus weevils (*Gerstæckeria hubbardi, G. nobilis, G. porosa, G. clathrata, G. basalis,* the first from Florida and the remaining species from Texas); (3) cactus bugs (*Chelinidea vittigera* from Texas, *Chelinidea* sp. from Florida); (4) wild cochineal insects, one or two kinds from Florida and Texas); (5) three or four different kinds of scavenging flies which breed in injured pear (*Volucella esuriens, V. fasciata, Copestylum marginatum,* and a large dark-coloured species of *Hermetia*); (6) four different kinds of fungi (*Glæosporium lunatum, Hendersonia opuntiæ, Phoma* sp., and *Perisporium Wrightii*); (7) a bacterial rot.

From some of the fungi and from the rot pure cultures have now been isolated in our laboratory in Brisbane, and are being subjected to experiment. Subsequently a number of pure cultures of three fungi (*Glæosporium lunatum, G. cactorium,* and *Hendersonia opuntiæ*) have been prepared and forwarded by Dr. Berger from Florida.

A consignment of material collected in Argentina by another member of the staff (Mr. W. B. Alexander), is now in Australian waters, and should reach Brisbane shortly. In addition to *Zophodia,* it contains the Argentina cochineal, as well as the fungi *Montagnella* and *Sclerotinia,* referred to above.

There is also in the laboratory some of the wild cochineal, *Coccus tomentosus* (apparently the same as the Texan form recently received), forwarded by Dr. Griffiths from Chico, California, to Mr. A. T. Clerk, and by him handed over to the writer last year. This has attacked three of the Queensland prickly-pears—viz., the common pest pear, the spiny pest pear of the Burnett and Rockhampton districts, and the tree pear (*O. tomentosa*); but its effects are so far practically negligible, as also are those produced by some of the cochineals from the recent consignment.

Apart from the bacterial disease which is at present being carefully studied in the laboratory, where it is giving promising experimental results, the most important enemy amongst those now in Brisbane seems to be the moth borer, *Melitara.* Judging from our previous experience, the South American insect *Zophodia* acts similarly. These moth-borers perform their destructive work while in the caterpillar stage, the grubs boring into the prickly-pear joints and feeding there gregariously until ready to spin the cocoons. Our pest pears are readily attacked by these organisms, which, like all the other insects referred to in this article, restrict their attentions to cactaceous plants. The larvæ of *Melitara* are at present hibernating, and it is hoped that during the forthcoming spring they will emerge and breed up. Until then, one cannot say that the importation has been successful. Many cocoons of this moth were sent across in cold storage, but none of the few which emerged laid any eggs, the result being perhaps due to unsuitable temperature while in the "cold room" of the steamer.

The bugs (*Chelinidea*), weevils (*Gerstæckeria*), and cochineals all seem to have settled down satisfactorily, and are breeding. Scavenging flies have bred out in large numbers from the Florida and Texan material sent across in cold storage, but nearly all have died, and since none have bred, it appears as if this portion of the work has not proved successful.

It should be mentioned that extreme care was taken in Texas and Florida to eliminate all parasitic or predatory insects whose activities would have been detrimental to the organisms which have been imported. This was done by breeding the material under careful supervision at Miami, in Southern Florida, the work having been carried out by the writer's lieutenant (Mr. Hamlin).

The South American fungi have not, as yet, given satisfactory laboratory results, as they have not responded well to our cultural methods. They are, however, very serious disease-producers in Argentina. Fungi generally require certain conditions of temperature, and especially moisture, for their greatest activity, and, when such are favourable, may cause considerable havoc. This is true of such forms as *Glæosporium,* which destroys the whole or part of the affected prickly-pear joint. *Montagnella* seems to be even more destructive in the field, and is capable of killing the entire plant.

In this biological attack on the prickly-pear pest, the writer is endeavouring to utilise organisms which act in various ways:—

(1) Firstly, there are those insects which actually eat pear—*e.g.,* moth-borers in their larval stage—and, to a less extent, the weevils and certain other beetles in both larval and adult stages.

(2) Then there are those which feed on the juices of the plant, interfere with its normal health, sicken it and may even poison it to such an extent as to kill part or the whole plant—*e.g.,* the cactus bugs and the various kinds of wild cochineal insects.

(3) Some insects attack and destroy the fruit wholly or in part—*e.g.*, certain midges, which have not as yet been imported (*Itonida, Asphondylia*).

(4) Injuries such as those caused by the first group allow the introduction of larvæ of scavenging flies which feed on the decomposing tissues, greatly aggravate the lesions and bring about a rapid destruction of the segment. Such organisms (*e.g.*, certain *Syrphidæ, Stratiomyidæ*, &c.) also passively assist in the introduction of sundry saprophytic fungi and bacteria which help greatly in the disintegration of the affected tissues.

(5) There are actual disease-producing organisms such as the fungi and bacteria referred to earlier in this article. Some are able to invade the plant through its stomata during warm moist weather (*e.g.*, *Glœosporium*). Others apparently enter through wounds whether made by insects, such as those referred to in (1), or made in some other way. No doubt sucking insects, such as cactus bugs, are capable of acting as inoculating agents for these disease-producers, especially the bacteria.

After having established the various organisms in the laboratory, experiments will be undertaken with a view to ascertaining whether any of them would be likely to become enemies of plants of economic value. When these tests shall have been satisfactorily passed, the pear-attackers will then be studied under field conditions in some selected prickly-pear centres. After that, such of them as prove to be of value will be distributed widely, but this is not likely to occur for some time, owing to the nature of the investigation.

When these desired and desirable natural enemies of prickly-pear shall have become fully acclimatised in Australia, they should then need little or no further attention after having been once liberated. They should go on propagating and attacking pear, their activities being controlled only by the climate and by the kind of pear attacked, unless some Australian parasite should adapt itself to these new hosts and thus limit their numbers and their usefulness. Biological control should then, theoretically, be ultimately inexpensive because natural. In some cases it has been necessary to keep a breeding stock under laboratory conditions to supply fresh material for districts in which conditions are not very suitable for some particular organism.

It is perhaps too much to expect that the new arrivals will act towards our prickly-pear as destructively (and as cheaply as far as expense goes) as the "Indian cochineal" did in regard to the "*Monacantha*" pear, but it is reasonable to hope that they will make a marked impression and so reduce the quantity of pear that the remnant will be more easily handled. Biological methods are the only means likely to be efficient in attacking pear in poor, inaccessible, or rocky country where time is not an important consideration, but where the excessive cost of chemical means of destruction would be. The biological attack, if successful, is likely to be much slower, but ultimately more effective, than the chemical; and, of course, the great difference in cost, not only at the time but in subsequent years, is also to be borne in mind.

This article has been written so that the public of this State may be aware of what is going on in regard to the attempted biological control of the pest, and also that the readers may realise that results cannot be promised within a definite time. The whole work is really a scientific investigation along certain special lines. As information of value becomes available, as a result of our experimental work, the writer proposes to make it known in the public interest.

GROUND COTTON SEED: AN EXCELLENT FEED FOR CATTLE.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College.

There are several diverse elements in the present economic situation which have a close inter-relationship with regard to use of cotton seed as a feed, particularly for dairy cattle. Thus:—

(1) The war declared that we required to grow cotton within the Empire. Queensland is one of the countries where cotton of superior quality can be grown, and we are making strenuous effort to induce our farmers to plant this crop.

(2) The price of butter has fallen, and is likely to go still lower.

(3) Wages have risen to a marked degree, and, though they may fall again, it cannot be expected that they will ever reach the low level of pre-war days.

Let us briefly examine how these three elements react on one another.

With regard to cotton, it is improbable that Queensland will grow this crop on big plantations. Rather, our development of cotton-production will be along the lines of planting comparatively small areas on each farm. This means that the cotton will have to be transported to some central station to be ginned. It has to be remembered, however, that after the removal of the lint there remains a large quantity of seed which has a high commercial value, both for the oil and feed nutrients it contains. If the oil is extracted and the residue is ground into a meal (cotton seed meal), it forms as rich a feed for stock as linseed meal. But if the oil is not extracted, the whole seed can be ground, as it forms an excellent cattle-fodder. The fact that our cotton has to be removed from the farms for ginning largely prevents the farmers from appreciating the high feed value of cotton seed. But the feed value of the seed should be stressed, and, if once generally recognised, it will greatly enhance the commercial value of cotton-growing. Therefore, the seed from the gins should be returned to the growers for home consumption, or else it should be ground and sold on account of the grower. It is in this latter regard that dairy farmers can be of great assistance to the cotton-growing industry, and, by helping it, they will, incidentally, help themselves.

As before mentioned, the price of butter has fallen, and is likely to go still lower. The dairy farmer can meet this adverse situation in one of two ways. Either he may increase the number of cows per milker, or he may keep the number of cows the same and only use those of high productive value. If he adopts the first course he will make his milkers slaves to their work, and this is entirely against the general trend of labour development, a development which justly aims at better wages and better living conditions. If he adopts the second course, as he should, he has every chance of maintaining good returns, even against the lower prices for butter. Certainly, cows of high productive value cannot be readily bought at the moment, but they can be bred. Associated with such breeding, consistent herd-testing must be carried out. The present average production of butter per dairy cow per year is certainly below 150 lb. There is no reason why any dairy farmer should not improve his own herd so as to average 300 lb. to 400 lb. of butter per cow per year.

Quite obviously, if one man can manage twelve or fifteen or twenty cows, take whichever number you like, the wage he can earn is determined by the returns the cows give. If they average only 150 lb. of butter per year, the wage that can be earned is half of what could be got if the same number of cows averaged 300 lb. of butter per year.

But good cows cannot yield to their full capacity unless they get sufficient feed. Again, good cows pay to feed. To have a cow capable of giving 400 lb. of butter-fat per year, and to so feed her that she only gives 200 lb., is as bad as buying a 20 horse-power engine when your heaviest work only requires 5 horse-power.

In the foregoing an endeavour has been made to show that the dairyman can hope to meet falling butter prices only by using improved stock. Once he gets this improved stock he must prepare to feed them in the off-season, so as to obtain the greatest profit from them. For this feeding nothing could be a better concentrate than ground cotton-seed meal. This has been used at the Queensland Agricultural College for the past two years, with excellent results.

Some idea of the value of ground cotton-seed as a cattle feed may be formed by a study of the following descriptive details:—

In appearance, ground cotton seed is not attractive. Adhering to the seed there is a small amount of lint, and after grinding the meal it seems to contain a large amount of hairy fibre. The amount of this, however, is not great, nor has it any of the properties of hair. The cotton present is a vegetable fibre similar to the indigestible matter contained in all vegetable matter, and it has no bad effects on the animal. The flavour of cotton seed does not attract animals, and they may take a little time to get used to it. Once they get accustomed to it they eat it readily. Because cotton seed has a tendency to bind the animal, it should not be used in excessive quantities. Probably 5 lb. to 6 lb. per cow per day would be the greatest amount that should be used.

In order to obtain some idea of the comparative value of good cotton seed, the following grain rations have been run out:—

	No. 1.	No. 2.	Difference.
	lb.	lb.	lb.
Bran	194 ..	162 ..	32
Crushed Wheat	33 ..	28 ..	5
Crushed Maize	329 ..	63 ..	266
Linseed Meal	244 ..	153 ..	91
Ground Cotton Seed ..	— ..	394 ..	—

Each of these feeds is of equal value for milk production, and would be used up to 1 lb. for each 3 lb. of milk given.

Thus, 394 lb. of ground cotton seed has the same value as the sum of the quantities shown in the third column above. If we take bran at ¾d. per lb., crushed wheat at 1d. per lb., crushed maize at 1d. per lb., and linseed meal at 1½d. per lb., the value of the cotton seed works out at about 1d. per lb., or, roughly, £9 per ton of 2,000 lb.

Ground cotton seed can be used for cattle, horses, and sheep, but it cannot be safely fed to pigs.

SPECIFICATION OF LABOUR AND MATERIALS REQUIRED IN BUILDING A PISE HOUSE AND FARM BUILDINGS OF ALL KINDS IN COUNTRY DISTRICTS.

By ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

In many country districts, especially when far removed from the railway, it is difficult, and often very expensive, to obtain usual building materials, such as bricks, cement, iron, and even sawn timber. In such cases it is useful to know how to utilise to advantage a material that can be found almost anywhere, and which costs nothing except the necessary labour to procure it. Earth can be used in several ways for walls, and if properly manipulated generally affords satisfaction. One method of using earth, adopted largely in Mexico and South American States, is that known as ''Adobe'' (pronounced ''Doby''), which is really nothing more than sun-dried bricks, or blocks made of earth and clay and allowed to remain before use a sufficient time for them to become thoroughly hard. This material has been used in that form for hundreds of years in the countries named, and buildings still exist in good order after 200 years' exposure to the elements. There is, however, more labour in handling ''Adobe'' than in the more modern method of Pisé construction. In the latter case one handling is sufficient, as there is no waiting for the bricks to dry before using in the wall, Pisé being built *in situ;* drying is not therefore necessary. But even when using Pisé it is an advantage to have a few blocks of ''Adobe'' handy for use in difficult positions, such as corners, fireplace openings, &c. Another useful method is known as ''Pug,'' or a mixture of chopped straw and mud, or, in some cases, long straw or grass may be used, thoroughly mixed with well-wetted earth in a hole in the ground; for mixing, a long fork or hoe is used, but if on a large scale, horse or some mechanical power should be available. No special appliances are required for this method of construction, as the material, after preparation, is simply laid on in successive layers about 12 in. or 18 in. thick, keeping them as upright and true as possible. The walls are then trimmed down by the spade or other suitable tools, and made all of one thickness and perfectly true and perpendicular. As the material is put together in a fairly wet condition, there is a certain amount of shrinkage, but it consolidates into a very hard mass and becomes very durable—warm in winter and cool in summer. The general wallwork can be done with unskilled labour, with proper supervision, but a skilled tradesman is necessary to cut out or trim up openings for doors and windows, and to keep the angles plumb. Very good and durable buildings can be erected on this system in the back country.

Another type of earth building is somewhat akin to that known as wattle and dab, but very much superior. It consists of a framework of saplings set into a sill adzed on the top side and laid on the level ground. The corner and intermediate studs are framed into the sides, the intermediate about 3 ft. apart, with heads and sills to doors and windows. Both the outside and the inside of the studs are then covered with 1½ in. mesh wire netting, which is held together and kept from spreading by wire loops, the length of which is equal to the thickness of the wall. These loops are placed at sufficient distances apart to prevent the netting from bulging. The space between the netting is then filled with very moist earth and rammed. It will be seen that the walls will be just the thickness of the saplings or studs. These walls can, if necessary, be plastered on both sides, as the wire netting forms a good key for the plaster, then whitewashed or coloured as desired.

In some situations this type of building would be very serviceable, and if a little skilled attention were paid to the roofing, which might be of bark laid symmetrically and whitewashed or coloured, a very comfortable residence would result.

The type of structure, however, to which attention is specially directed, and to which the following specification refers, is that known as Pisé, which combines all

the good qualities of the others and may be erected by any person in the bush who is handy with tools and can use the level and plumb bob.

The accompanying drawings are intended to illustrate a house of this character, and, in order that the process of building same may be thoroughly understood, the specification is written in plain language, avoiding technicalities as far as possible.

Before commencing operations, the builder should provide himself with moulds for the walls, rammers, and other necessary articles, as he cannot perform good and durable work without them. The plant required will depend on the number of men employed, and, as three is the minimum number to perform the work economically, the following will be necessary:—A horse and dray or some other means of transporting the material to the building, two wooden rammers, two plasterers' wood floats, two straight boxes or moulds, two angle boxes, some short lengths of light wood for blocking up the ends of boxes, a supply of sawn scantling of different sizes, some ⅜-in. bolts, nuts and washers, gauge rods, shovels, spades, a watering can, buckets, tank or barrel for water, and some other articles which will be necessary as the work proceeds.

After collecting the plant and fixing the site, the first thing to do is to prepare the foundations. To do this the building must be accurately set out and the correct position and thickness of all walls pegged out, the pegs being put in about 3 ft. outside the intersection of walls, so that they are not disturbed when excavating the footings. It may be well to point out that, in setting out buildings perfectly square with walls at right angles, a good-sized square is necessary, which can be easily made by anyone out of long battens or flooring boards. The correct angle is assured by measuring one side 6 ft., the other side 8 ft., with the hypotenuse or diagonal between the above points exactly 10 ft., or any multiple of the same.

The footings of all walls should not be less than 9 in. wider than the walls they carry, projecting 4½ in. on each side. In suitable ground they need not be more than 4 in. in depth, which will be obtained by taking off the top sod to that depth. If the ground slopes, the footings should be stepped; that is, they should be excavated level for short distances, then a step should be left, and another length taken out level. These footings should then be well watered before placing any material in them; when filled in, they should be well rammed and made quite level and flat on top. Before proceeding with the walls, the boxes or mould must be prepared of any convenient size and of any kind of wood that will not twist or warp, the lighter the timber the easier it is to handle. It will be found generally that 2 ft. is a convenient depth for boxes for ordinary buildings, but for large buildings 3 ft. may be a more suitable depth. Twelve inch by 1½ in. boards, with ledges on the outside, will be found convenient, and a broad ledge or brace should be placed at each end. The ledges should be about 2 ft. apart, and ½ in. iron bolts, long enough to go through the walls, with heads, nuts and washers provided for bolting the boxes together. A set of one dozen iron angle-brackets should also be provided for securing the boxes at angles, otherwise it will be difficult to keep the angles plumb and true. Care must be taken in fixing the boxes to have them perfectly level and plumb, and a little time and patience in accomplishing this will often save much annoyance, resulting from the walls out of plumb.

The door and window frames should also be prepared and ready for use when required, as they should all be built in as the work proceeds.

The next thing to do is to remove the turf from the ground and give the earth a fairly good soaking with water, so that when pressed together in the hand it will adhere and form a solid mass. It must not, however, be too wet, or it will not compress properly when rammed. All roots and timber should be taken out, also all large stones. Fill in the boxes from 6 to 12 in. high at one time, and well ram the same. The wall will then set firm and hard, and be impervious to storms.

The provision of a damp course must not be neglected, as the ground moisture will gradually rise by capillary attraction, and cause discomfort in the rooms. This will probably not be noticed for a long time after completion, but as the earth is always more or less damp, sooner or later, unless prevented by some means, its effects will be seen and felt. In brick and stone buildings special damp-proof courses are built in, just below the ground floor level; and in Pisé construction a good damp course may be formed by building in the wall, for its whole width, just above the ground line, a sheet of malthoid (1 ply), which will be thoroughly effective. This should be carried through all door and french light openings, and lapped 6 in. at joints.

All door and window openings should be boxed up carefully as near as possible to the finished sizes, so that little or no patching up will be required.

Cypress pine plugs should be built in all door and window jambs, heads and sills, as shown on detail drawings. These are necessary for securing frames and linings, and to a large extent will make subsequent plugging unnecessary.

All openings should have good Cypress pine lintels, having at least 1 ft. bearing on the walls at each end, those over verandah openings to be whole logs adzed on the underside, resting 18 in. on the wall at each end, each face of the same to have stout nails driven in a few inches apart, which will form a key for a plaster cover. The faces of these lintels may be lined with Cypress pine, or they may be covered with cement compo, or lime plaster with a small quantity of cow's hair mixed in same; the nails before mentioned will form a key to hold it to the timber, and, when floated off with a wood float and finished with the Pisé wall, will be durable and effective.

In districts where cement can be conveniently obtained, the heads and sills of ordinary openings could be made of cement concrete in the proportion of six parts gravel, containing a good proportion of sand, and one part of cement. These could be reinforced and made very strong by inserting in same a few strands of barbed wire turned over at the ends so as to prevent them drawing out.

The fireplace should be faced with brick or concrete, the hearth laid with cement, and the chimney built either of brickwork with a 9 in. flue or of concrete with a 9 in. drain pipe built in for the flue, finished on top with a flue pipe projecting about 6 in. above a bevelled cap.

All the Pisé walls—both sides—should be lightly sprinkled with water and worked over with the wood float, using screeds where any straightening is required.

The top plates should be secured in position on the walls, as shown in detail drawing.

Openings to be left in all walls for ventilation just below the ceiling line, by building in boxes specially prepared and of suitable sizes, ventilators to be not less than 2 ft. 6 in. by 1 ft. 6 in., and to be placed generally over doors and windows.

Build in woodplugs 4 in. by 2 in. and the thickness of the walls at intervals of 3 ft. for securing skirtings, dados, picture rails, architraves, &c.

CARPENTER AND JOINER.

Joists to be of 5 in. by 2 in. Cypress pine resting on 4 in. by 2 in. plates on the walls and on piers where the bearing exceeds 10 ft. Joists to be spaced 18 in. apart, centre to centre; verandah floors to be laid with a fall outwards of 1½ in. where exposed to the weather.

Provide ready for building in, and mark the correct position for all plugs, stays, and braces, also all plates, and provide and carefully fix all door and window frames as shown on detail drawing.

All door and french light frames to be 5 in. by 4 in. solid Cypress pine, with heads and weathered and sunk sills grooved for tongue of linings and fitted with stops, &c., necessary for door hanging.

If preferred, the grooving in the frames may be dispensed with in most cases, and a fillet nailed on the back of the solid frame to which the lining can be nailed.

All door, french light, and window frames to have 1¼ in. Cypress pine wrot linings, tongued into the frames or nailed securely to fillets at the back of the frames, to be finished on both sides with 4 in. by 1¼ in. plain chamfered architrave. Windows to have 1½ in. sills on the inside, with 2 in. nosing and scotia under and a 2 in. sill on the outside, laid to a bevel with returned ends, sufficiently wide to carry the architrave. French lights to have 1½ in. sills both sides, in addition to the solid 5 in. by 4 in. sill of the frame. Window frames to have mullions, as shown, with all necessary stops for casements. Four inch by 2 in. wood plugs to be built into walls every 3 ft. in height of opening to nail linings and architraves to. Ceiling joists to be of Cypress pine, round timber, not less than 7 in. in diameter, adzed flat on the top for receiving the ceiling linings; joists to be spaced not more than 3 ft. centres, and to be notched into wallplates, and extend 3 ft. over the face of wall, the ends of same to be cut off true to line for fascia board, and cut slightly back below the fascia.

Ceiling joists of verandahs to be similar to the above, trimmed into each other where necessary, and spaced not more than 3 ft. apart, centre to centre.

Rafters, collars, and braces to be 4 in. by 2 in. sawn Cypress, spaced to suit the ceiling joists, bevel cut where necessary, and securely nailed. Ridge to be 8 in. by $1\frac{1}{4}$ in., eaves fascia dressed 7 in. by $1\frac{1}{4}$ in., battens 3 in. by $1\frac{1}{2}$ in., spaced so as to have not less than three battens under every sheet. Batten up valleys and hips with an extra thickness at eaves.

Lay all floors with 6 in. x 1 in. grooved-and-tongued Cypress pine flooring, well cramped up, and nailed with two nails to each joist and dressed off at completion.

Ceilings and soffits of eaves to be lined on top of ceiling joists with 6 in. by 1 in. t. and g. Cypress pine, with scotias and fillets at all angles.

Build in walls plugs for nailing skirtings, chair rails, picture rails, &c., at suitable distances apart, plugs to be of such size as to be completely covered by the timber work to which they are nailed.

Fix round inside walls of all rooms 6 in. by 1 in. chamfered skirting, scribed to the floor and to architraves.

Fix 4 in. by $1\frac{1}{2}$ in. chair rail, chamfered on edge, round the walls of living room, bedrooms and kitchen, and 2 in. by $1\frac{1}{2}$ in. pictures rail round the same rooms.

Build the stove recess in kitchen, as shown on drawings, with 3 in. by 2 in. studs, lined with iron on the outside, and finished as shown, with cement hearth. Two small lights to be built in recess, fitted with $1\frac{1}{2}$ in. rebated frames with 16 oz. sheet glass, and hung on pivots with cords for opening same and suitable fasteners.

Frame for outside wall of sleeping verandah with 4 in. by 3 in. studs on a 4 in. by 2 in. bottom sill and capping piece, with a 6 in. by 2 in. weathered and throated sill projecting 2 in. from the face of the wall, and a 4 in. by 2 in. top plate. Studs and mullions to run through from bottom to top, and checked into head. Panels below openings to be filled in, either with 4 in. by 1 in. g. and t. Cypress pine or with fibro-cement sheeting $\frac{1}{4}$ in. thick, and secured in position with fillet on both sides.

Fix 12 in. by $1\frac{1}{2}$ in. mantel shelf and jambs to kitchen fireplace, and a pine mantel and jambs to the living room.

Fix 50 ft. super of 12 in. by 1 in. shelves in kitchen, on brackets properly secured to wall plugs.

Provide and fix tank-stands, where shown, with hardwood or Cypress pine stumps, and hardwood joists, and 6 in. by $1\frac{1}{2}$ in. sheeting.

French lights to be 3 ft. 6 in. by 7 ft. by $1\frac{3}{4}$ in. pine with moulded and rebated bars 1 in. thick, double hung with 4 in. butts, and fitted with two bolts on the inside, and rebated mortise locks with brass or oak furniture.

Doors in kitchen to be $1\frac{3}{4}$ in., framed and ledged and filled in with 1 in. g. t. and v.-jointed pine, hung with 4 in. butts and fitted with 6 in. rim locks with brass furniture.

Door from living room to back verandah to be $1\frac{3}{4}$ in. framed with moulded, rebated and glazed panels hung with 4 in. butts and fitted with rim lock as before.

Other doors to be $1\frac{3}{4}$ in. four panelled pine, hung as before, and fitted with 6 in. rim locks with brass furniture.

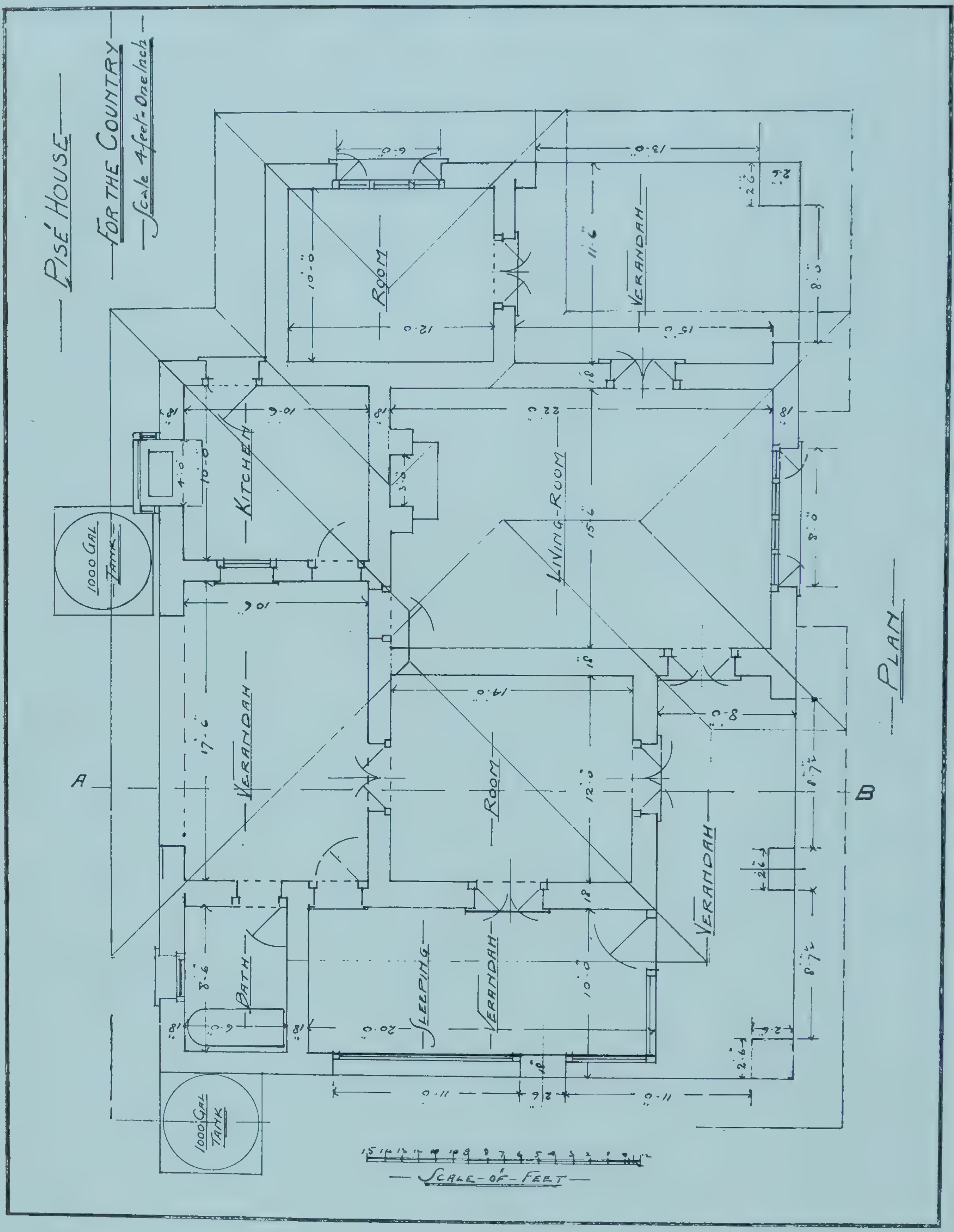
All windows throughout to have $1\frac{3}{4}$ in. pine casements with moulded and rebated bars 1 in. thick, glazed with 16 oz. sheet glass, well sprigged, puttied and back puttied, hung with 3 in. butts and fitted with bronze casement fasteners and 4 in. bolts. All casements, where possible, to be hung to open outwards.

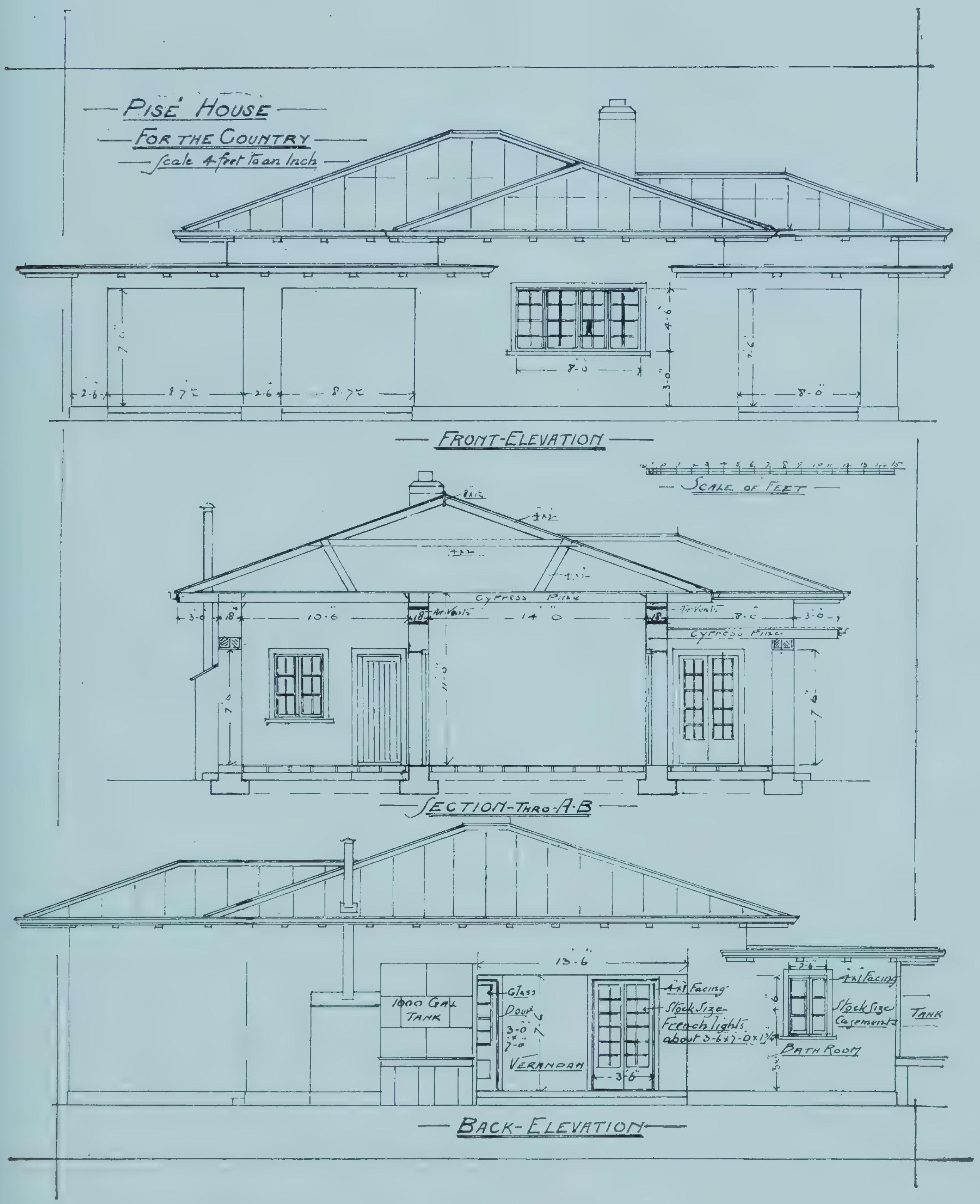
All doors and windows throughout to be fitted with stops the necessary widths and thickness required.

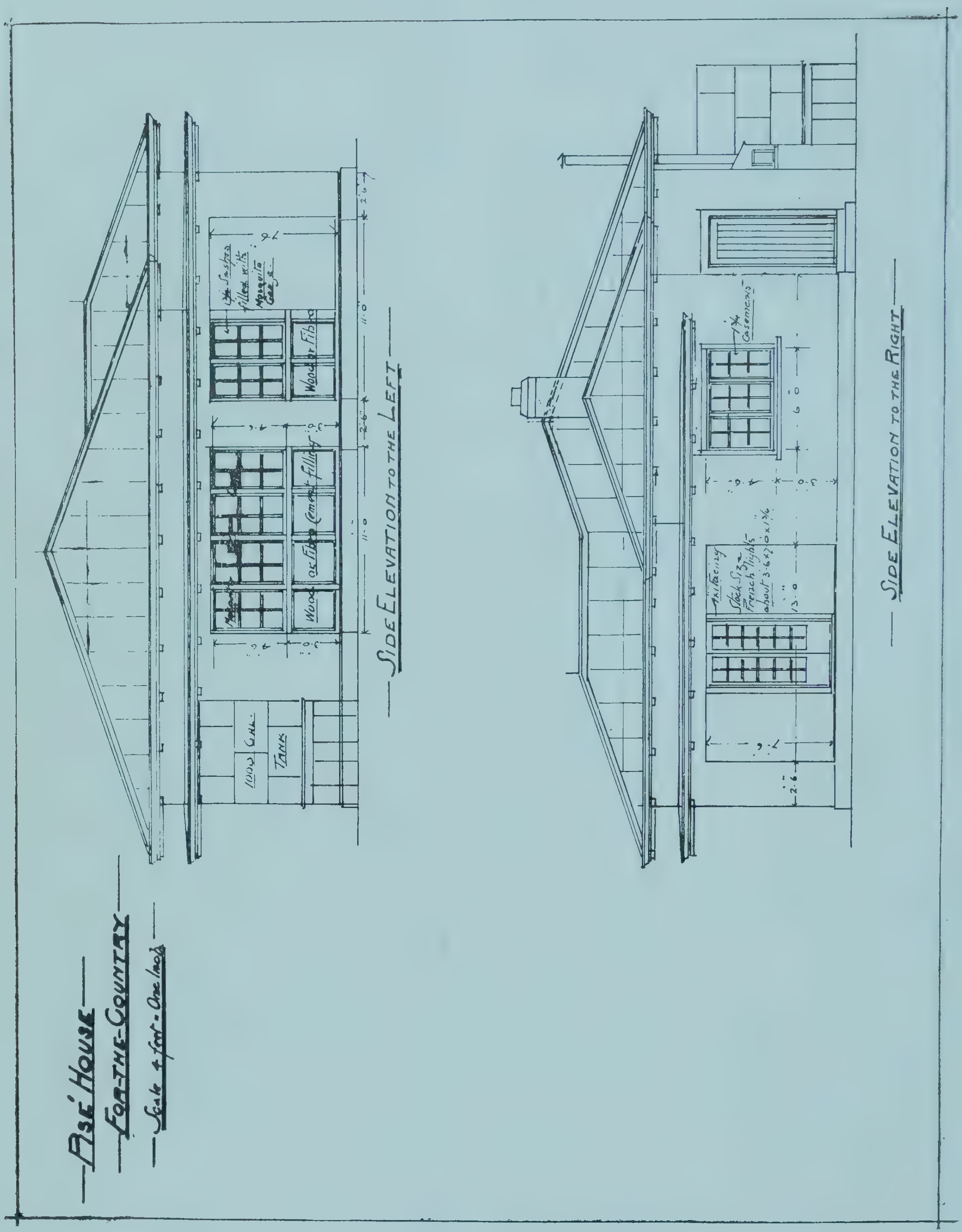
Fix bronze hooks in suitable position for fastening back french lights and doors.

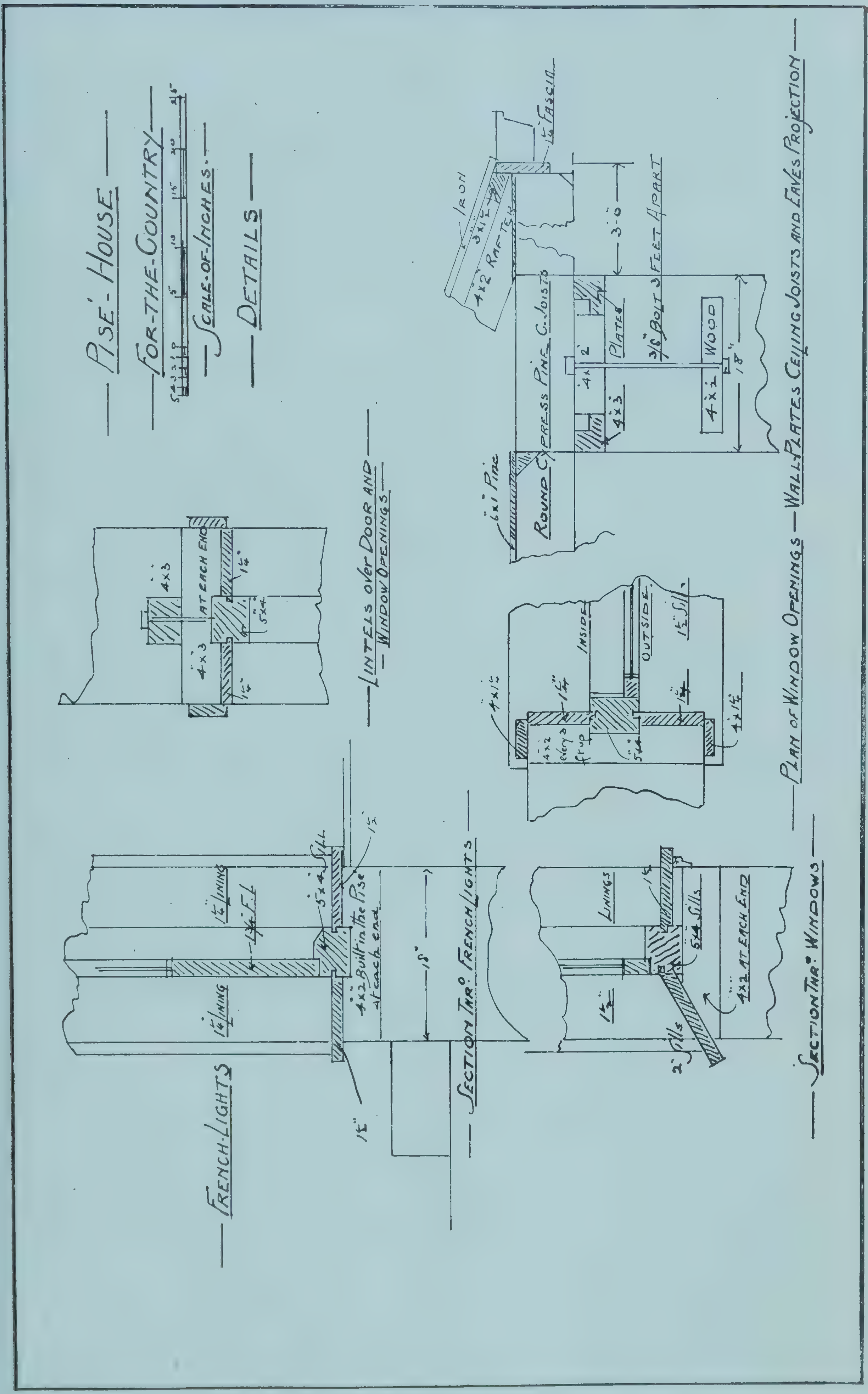
Fix in each room over door and window openings lattice work ventilators made with openings 1 in. square, 2 ft. 6 in. by 1 ft. 6 in., and provide all necessary stops and linings to same.

Finish round all doors, windows and other openings with 4 in. by 1 in. chamfered architraves on both sides.


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet - One Inch
ROOM
VERANDAH
KITCHEN
LIVING-ROOM
1000 GAL TANK
VERANDAH
ROOM
VERANDAH
BATH
SLEEPING-VERANDAH
1000 GAL TANK
A
B
PLAN
SCALE-OF-FEET


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet to an Inch
FRONT-ELEVATION
SCALE OF FEET
Cypress Pine
Air Vents
SECTION-THRO-A·B
1000 GAL TANK
Glass Door 3-0 × 7-0
VERANDAH
4×1 Facing
Stock Size French lights about 3-6×7-0×1¾
4×1 Facing
Stock Size Casements
BATH ROOM
TANK
BACK-ELEVATION


SIDE ELEVATION TO THE LEFT
1000 GAL. TANK
SIDE ELEVATION TO THE RIGHT


PISE'-HOUSE
FOR-THE-COUNTRY
SCALE-OF-INCHES
DETAILS
LINTELS OVER DOOR AND WINDOW OPENINGS
PLAN OF WINDOW OPENINGS
WALL PLATES CEILING JOISTS AND EAVES PROJECTION
SECTION THRO' WINDOWS
SECTION THRO' FRENCH LIGHTS
FRENCH LIGHTS
ROUND CYPRESS PINE C. JOISTS
4"x2" RAFTER
IRON
PLATES
3/8" BOLT 3 FEET APART
WOOD
3'-0
18"
4x3
AT EACH END
5x4
INSIDE
OUTSIDE
LININGS
5x4 SILLS
4x2 AT EACH END
4x2 Built in the Pise at each end
5x4 SILL

Fill in sashes on sleeping verandah with mosquito-proof wire gauze, and fix same with stops on both sides, well secured.

These sashes may be made with bars 1 in. thick, moulded on the outside, but left flush at the backs, so that the mosquito-proof gauze will pass over the bars and be secured with a stop planted on the back.

Provide and fix, where pointed out, one dozen bronze hat and coat hooks on 5 in. by 1 in. chamfered rails, and provide and fix in kitchen one dozen cup hooks.

Do all the work necessary to complete this branch in a satisfactory manner.

PLUMBER.

Roof of verandahs to be covered with 2-ply malthoid, laid as instructed by the selling agents, on close boarding provided and fixed by the carpenter, turned up against walls, properly flashed, and joints cemented as instructed by agents, to be left perfectly sound, weatherproof, and satisfactory.

Five inch by 4 in. galvanised-iron spouting to be fixed to all eaves, on brackets as required, with soldered points, stop ends and angles. Water to be conducted to the tanks with all necessary 3 in. down pipes.

Other roofs than the above to be covered with 26-gauge galvanised iron, approved brand, laid with 1½ in. corrugation at sides and 6 in. at ends. Valleys to be laid as shown, with 24-gauge plain iron; cover hips and ridges with 24-gauge 16 in. wide, lead-headed nails to be used throughout.

Provide and fix two 1,000-gallon tanks, with mosquito-proof hoppers and frog-proof overflows, fitted with cleansing plugs and lever taps.

Provide and fix a 5 ft. 6 in. galvanised-iron corrugated bath, with waste plug and chain. Connect a 2½ in. waste pipe to same, and convey it to a suitable position outside to be approved.

Provide and fix over same a shower bucket with rose and lever tap cords, pulleys and block for hoisting and lowering.

Cover the inside walls of bathroom up to a height of 5 ft. with small corrugated galvanised-iron sheeting, with roll on top.

Provide and fix a stove in kitchen, value £ net cost; fix stove piping, and carry up same above roof, flashed where necessary.

PAINTER.

Knot, stop, rub down and properly prepare all wood and iron work for painting which is usually painted, such as eaves, gutters, down pipes, fascias, outside doors, and windows. All the above woodwork to be painted three coats approved colours with approved linseed oil and white lead, ironwork to have two coats only.

Inside doors and windows, skirtings, picture rails, chair rails, &c., to have two coats of best approved varnish.

All outside walls to be twice coated with limewash containing half a pint of raw linseed oil to each gallon, and inside walls to be coated with limewash as above, but coloured by the addition of any suitable dry colours.

MIXING OF FERTILISERS.

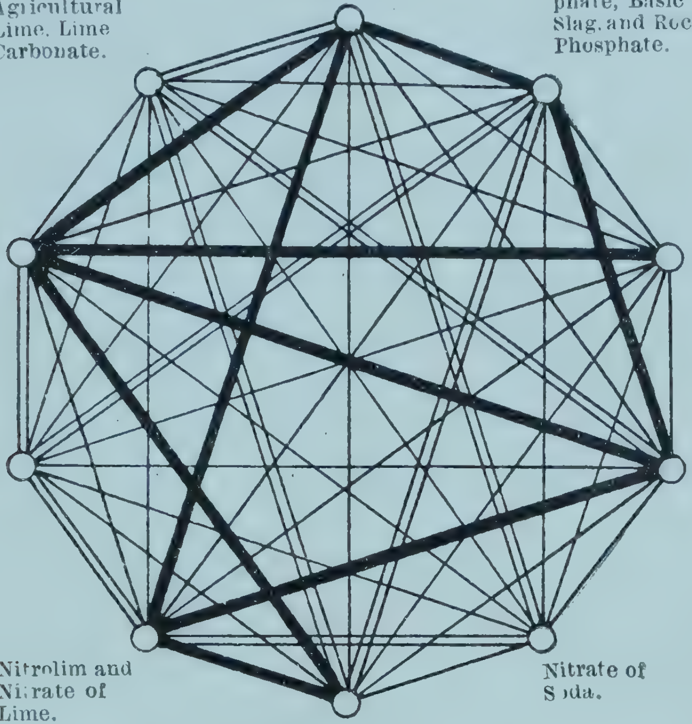
By J. C. BRÜNNICH.

Many of the users of fertilisers prefer to make their own mixtures, specially suited to their requirements, instead of using ready-mixed complete fertilisers; but, in order to do this successfully, it is absolutely necessary to have a knowledge of what kind of fertilisers can be safely mixed.

In many cases great losses of the most valuable of all fertiliser constituents—the nitrogen or ammonia—have been caused by mixing lime or fertilisers containing lime with sulphate of ammonia, bone dust, and meatworks fertilisers, &c.

In other cases, by some chemical changes or by absorption of moisture from the air, the mixture sets very hard or becomes lumpy in the bags, and, therefore, difficult to apply.

The diagram below, originally devised by Dr. Geckens, and used for some time in our publications, has been amplified and modified to apply to local conditions.:—



All fertilisers joined by a *single line* can be safely mixed together and kept for any length of time. Fertilisers joined by a *heavy black line* should never be mixed together; those connected by a *double line* should only be mixed immediately or a short time before application.

Great care must be taken when making mixtures of fertilisers, and all lumps must be broken up and, if necessary, passed through a sieve before mixing. The various portions should be carefully and thoroughly mixed in small quantities, and the small heaps formed turned over a few times and then all mixed together. It is sometimes better to allow the mixture to remain in heaps for some time before bagging, to prevent forming lumps or setting hard in the bags.

A NEW GRASS PEST OF THE ATHERTON TABLELAND.

By ALAN P. DODD, Assistant Entomologist to the Bureau of Sugar Experiment Stations.

During the drier months of 1920, viz., July to November, the farmers of the Atherton Tableland became seriously perturbed through the ravages of a grass caterpillar that threatened to destroy a great proportion of the pasture in certain areas. Dr. J. F. Illingworth made a brief visit to the district, 29th September to 3rd October, 1920, and subsequently the writer made two short excursions to the locality, 1st to 5th March, and 10th to 13th April, 1921. Our knowledge of the pest has been obtained from these limited investigations, and is embodied in the following report. I have to thank Dr. Illingworth, who has kindly allowed me to make free use of his notes. My thanks are also due to the many farmers who have helped us in our survey, and through whom we were enabled to make as complete an examination as time permitted.

HISTORICAL AND GEOGRAPHICAL.

The moths were submitted to Dr. A. J. Turner, of Brisbane, a well-known authority of *Lepidoptera,* who determined them as *Oncopera Mitocera* Turner, a member of the family Hepialidæ, the larvæ of most of which tunnel in the trunks and roots of living trees, and are often of very large size. Dr. Turner writes, "There

are only two species of *Oncopera* (the writer has accepted Dr. Turner's spelling of the word *Oncopera*, though it is usually written as *Oncoptera*); *O. intricata* occurs commonly in Victoria and Tasmania." It is interesting to record that *O. intricata* is a well-established grass-destroyer in these States, and its habits are practically identical with our species. In the "Destructive Insects of Victoria," 1909, French calls it "the dark-green grass caterpillar," and writes that "the larva of this moth is, without doubt, the most destructive of all grass-eating grubs known to myself."

Oncopera Mitocera appears to be confined to North Queensland, and possibly to the Cairns district. Early in 1911, Mr. F. B. Dodd observed the moths flying very plentifully at dusk, on the edges of the Evelyn Scrub, near Herberton. The first record of the insect as a pest seems to be contained in a letter written by Mr. J. George Jones, of Ravenshoe, 15th September, 1919, in which he states that it was "then engaged in clearing out patches of good pasture in this district." No word of its occurrence around Yungaburra was heard until August, 1920, when the farmers suddenly discovered that a new and serious pest had appeared among them. Probably the caterpillars had been there for several years; in fact ever since the clearing of the scrub, but never in such numbers as to attract attention. The moths have been noticed in considerable force at Kuranda, and we know that the larvæ occur in the scrubs around Babinda. Thus the species is found at all heights, from sea-level to 3,500 ft. in the Cairns district.

DESCRIPTION OF THE STAGES.

The moth measures 1½ to 1¾ in. across the outstretched wings; it is of a rather rich brown in colour, the forewings somewhat irregularly mottled with darker and lighter shades, the hindwings uniformly sooty. The wings are rather narrow, the hindwings longer than is usual and inclined to be pointed. The body is long and slender, and the head has a conspicuous clothing of woolly hairs.

The larva or caterpillar is long and slender, measuring up to 3 in. in length, of a dirty dark-green colour; the head is brown and hard. They are very active, and wriggle convulsively when handled or otherwise disturbed.

The chrysalis or pupa is of a light brown, the head darker, hard, and roughened; it measures about an inch in length; the body segments are each armed with two transverse rows of close saw-like teeth, which serve to propel it up the vertical shaft and prevent it from slipping down to the bottom.

LIFE HISTORY AND HABITS.

The moths are on the wing during the late summer; only an odd one was observed by the writer early in March, and it was obvious that the main emergence had not taken place. However, by the middle of April, though they were plentiful enough, it was evident that the main brood was over. The eggs are probably laid scattered about the ground among the grass. Each female is capable of depositing a vast number. When held tightly between the fingers they will lay strings of tiny creamy-yellow eggs.

There is little doubt that the life cycle is completed within a year. Early in October it was found that the larvæ were about two-thirds grown; by the first week of March excavating in numerous places gave full-grown and pupating larvæ, and pupæ; by the middle of April no larvæ could be found, and only a very occasional pupa, the moths then being on the wing.

The caterpillar constructs a vertical shaft or tunnel of about the diameter of an ordinary lead pencil, varying from 5 to 16 in. in depth, and lined with strong, fine silk. In the pasture lands the tunnels are covered with a mat of webbing and frass, but in the scrub, strange to say, no covering is constructed, the holes being bare and open. Thus it would seem that this protection is a habit acquired in the few years that the caterpillars have adapted themselves to the changed conditions of the open fields, from the shade and shelter of the scrub. The larvæ clean out their tunnels, placing the excrement on the surface near the opening, and this is the most easily recognised feature of the pest. The tunnel is quite straight, without cross-sections; in this the caterpillar lives, coming up at night and reaching forth to feed on the grass blades. Apparently fresh leaves are not essential, for in the scrub the surface of the ground is bare of vegetation, and here, no doubt, fallen leaves and decayed vegetable matter are consumed. It does not seem feasible that they travel through the soil; in fact, they are not hardy creatures, and when taken from their tunnels and placed in fresh soil, frequently die, though in some cases they live and construct new tubes. Although it is a generally held opinion that grass roots

are eaten, this does not seem correct, at least as regards underground roots. The grass apparently dies through the action of the caterpillar gnawing at the stock and back on to the base of the roots from the surface.

When ready to pupate, the larva becomes almost milky-white in colour. The pupa or chrysalis rests at the bottom of the tunnel, its horny head protecting it from intruders. When ready to emerge, it works its way to the surface, and projects about one-third of its length above the ground; thus, when the moths are on the wing, it is quite usual to see these empty chrysalis shells poking out of the ground.

Vast numbers of moths do not feed in the adult stage, and *Oncopera* is one of these; hence its aerial life must be comparatively short, probably about a week. The moths fly at dusk, before it has become dark; in a few minutes myriads are on the wing, in a wild, erratic, jerky, and very fast flight. The flight lasts for a few minutes, and ends as suddenly as it began. A few are attracted to lights, but not in sufficient numbers to suggest trapping. During the day they settle in a sheltered and, often, dark position; in the fields they can be captured commonly, resting on stumps of trees, or on walls of buildings, &c.

NATURE AND EXTENT OF INJURY.

There is no doubt that the species in question is a native of the scrubs, as the tunnels can be located in numbers anywhere in such situations around Yungaburra and Ravenshoe, and we have observed them in virgin land at Babinda. With the clearing of the land and its planting to grass, favourable conditions have arisen for rapid increase; and, too, its natural enemies in the scrub would not be liable to change their habits so readily and follow their host into the open. We can safely say, then, that these factors have accounted for its sudden development as a pest of serious dimensions. The principal area affected is immediately around Yungaburra, from Kulara on the north to Kureen on the south; in the older-settled portions, near Atherton and Kairi, it has not made its appearance; and southward, around Malanda, though the caterpillars were found abundantly in the scrub, none could be located in the pastures. Another area infested, though not to the same extent, is situated eastward from Ravenshoe, on the higher land toward the Beatrice River, at a height of 3,200 to 3,500 ft. above sea level.

The pest occurs throughout there areas, almost each farm being more or less affected. In the worst situations the paspalum and Rhodes grass have been killed out in small patches; as a result, the fields present a very ragged appearance instead of a luxuriant carpet of grass. In any case, where the caterpillars occur in any number the pastures are seriously depleted and, therefore, cannot carry their full complement of stock. As the pest does its chief damage during the drier parts of the year, when good grazing is most needed, this is a serious matter. Where they occur abundantly, as many as thirty larvæ can be dug up in a cubic foot of soil. Early in the year they have finished feeding, and the summer rains invigorate the grass, so that in many instances, especially in the case of paspalum, there is soon a splendid growth, but bare patches every here and there testify to the work of the scourge.

NATURAL MEANS OF CONTROL.

Our limited investigations allowed almost no breeding work, and, therefore, no parasites were discovered. Jumping spiders catch a few of the moths, and they are also frequently caught in spiders' webs.

No doubt, nightjars, that hawk over the fields at dusk, destroy many of the moths, but in the open fields of the Tableland the absence of birds which might help materially to check the ravages of the pest is very marked.

Climatic conditions must be an important factor in the increase or decrease of these caterpillars, and heavy rain, or an excessive wet season, may go far toward restricting their numbers. The month of March, 1921, was exceedingly wet, heavy and continuous rain falling. At this time the insects were either in the pupal or in the moth stage; in the latter case probably many were drowned, and their eggs destroyed. When the locality was visited in April, it was found that the coverings of the tunnels had been washed away, and often the mouth of these shafts had been covered over with silted earth; indeed, in one badly infested field, dead pupæ were found that had failed to break through the soil washed over the opening. A case was heard of where the larvæ were prevalent in a low-lying field earlier in the season; the first heavy rain flooded this land, and the caterpillars came to the surface in thousands and were washed away. Many farmers are of the opinion that the very heavy rainfall of March has given the pest a grave setback, and the writer is inclined to share their views, but it remains to be seen how serious this insect will be in the ensuing season.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR JUNE, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter	Remarks.
			Lb.	%	Lb.	
Prim	Holstein ...	9 Mar., 1921	1,197	3·5	46·48	
Wattle Blossom ...	Guernsey ...	24 May ,,	715	5·2	43·50	
College Cold Iron	Jersey ...	13 Mar. ,,	795	4·8	42·90	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	1,0[illegible]7	3·5	39·33	
Charming Damsel	Ayrshire ...	12 May ,,	[illegible]98	3·7	28·75	
Netherhall Queen Kate	,, ...	17 April ,,	667	3·6	26·65	
Lilia	,, ...	3 April ,,	595	3·8	25·30	
Hedges Dutchmaid	Holstein ...	26 May ,,	713	3·2	24·3[illegible]	
College Evening Glow	Jersey ...	10 Nov., 1920	328	6·2	23·79	
Confidence... ...	Ayrshire ...	8 Feb., 1921	569	3·7	23·35	
Miss Fearless ...	,, ...	25 May ..	642	3·2	22·95	
Margaret's Leda ...	Jersey ...	6 Oct., 1920	382	5·0	22·34	
Gatton Empire Lass	Guernsey ...	3 May, 1921	467	4·1	21·42	
Thornton Fairetta	Jersey ...	15 Mar. ,,	326	5·5	20·97	
Confidante ...	Ayrshire ..	12 May ,,	462	4·0	20·58	
Leda's Jessie ...	Jersey ...	14 Jan. .,	240	7·0	20·39	
Dawn of Warragaburra	,, ...	15 Oct., 1920	329	5·2	20·01	

NOTE.—Only cows producing 20 lb. of butter, or over, for the month are included in this list. The rainfall at the College for the month of June totalled 608 points.

PROBLEMS OF COLD STORAGE.

How much of the world's food supply is now kept in cold storage is difficult to say, but it must form a very large part of the total of perishable foodstuffs. It is not surprising, therefore, that the problem of getting the atmospheric conditions in cold storage premises exactly right for the long preservation of food has attracted the attention of the scientific mind. One phase of the problem is to secure the right degree of humidity or dampness in the atmosphere. For ordinary weather readings a wet and dry bulb thermometer is used, but in cold stores it is not reliable unless it is in a constant draught. An instrument recently exhibited before the Royal Society of Great Britain has a wet and dry bulb mounted in a tube through which a tiny electric motor draws a current of air. In another dampness measurer, designed to give a reading at a distance, the dampness affects a hair, to which a pointer is hung. The principle is the same as in the old familiar "weather house" with doors, through which a man or a woman emerged according to whether the air was dry or damp. In this instrument, however, the pointer moves over a drum which is really a resistance coil, and the degree of dampness is ascertained by measuring the electrical resistance at the point where the pointer is in contact with the coil.

The Horse.

CERTIFICATES OF SOUNDNESS.

List of Stallions registered and certified as sound, in the course of the month of June :—

Name of Horse.	Owner's Name and Address.
BLOOD STALLIONS.	
Roseacre (L)	Wilson and McDouall, Calliope Station, Calliope.
TROTTERS.	
Blainwood (L)	D. Wilson, Brisbane.
Harold Beldon	H. V. Leslie, Rosewood, Kalkie.
PONIES.	
Ashton (L)	N. V. Nielsen, Targo street, Bundaberg.
Young Gaffer (L)	A. T. Noyes, Alexander road, Clayfield.
Togo	T. R. Kennedy, Gladstone.

SOMETHING NEW IN WINDMILLS.

Many attempts have been made to solve the problem of efficiently utilising the winds as a means of generating electricity. The difficulties arise from the extreme variations in the force of the wind and from the liability, even in windy regions, to periods of calm during which no power at all can be obtained. These conditions suggest that wind power should be used only as an auxiliary to some other source of energy, such as the burning of coal or oil. Now that fuel of all sorts has multiplied in price, there is all the more reason for considering the possibility of turning the wind to account. Hitherto, the usual plan has been to use a large slow-speed windmill to drive a dynamo at a high speed through gearing—a rather wasteful arrangement. During the war, however, there was in Great Britain a remarkable development in the design and construction of small high-speed dynamos on aeroplanes. These dynamos were direct-coupled to propellers, or rather "impellers," driven by the wind created by the aeroplane in flight. A British firm has devised a scheme for fitting three or more of these wind-dynamos on the swivelling top of a vertical pole, with a vane to keep them in position against the wind. Each equipment gives 60 watts, and the arrangement forms a cheap and efficient auxiliary to the ordinary country-house lighting installation. The energy produced is, of course, stored in accumulators in the usual way. The operation of the plant is entirely automatic, and it is so light and simple that it presents no obstacles in erection and maintenance.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JUNE, 1921.

There was a drop in production for the month, due to the excessive rainfall. In the second week over 5 inches of rain fell. The light breeds took unkindly to the conditions, a number moulting, and others going off for several days. During the last week the heavy section made a big improvement. Generally, the health of the birds is splendid. There were seven cases of broodiness. Two deaths were recorded, viz., Mr. Harrington's Rhode Island Red, from ovarian disorder, and Mr. Newberry's White Leghorn, inflammation of the bowels. The following are the individual records:—

Competitors.	Breed.	June.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	95	349
H. C. Thomas	Do.	102	347
F. Birchall	Do.	110	343
*G. Trapp	Do.	114	347
*W. and G. W. Hindes	Do.	112	327
*J. M. Manson	Do.	125	315
Oakleigh Poultry Farm	Do.	112	313
*H. Fraser	Do.	119	309
*C. M. Pickering	Do.	107	306
*H. C. Towers	Do.	108	303
*Mrs. R. Hodge	Do.	105	302
*J. Newton	Do.	94	296
R. C. Cole	Do.	91	295
W. A. Walson	Do.	72	294
O. C. Goos	Do.	87	278
*W. Becker	Do.	96	262
*T. Fanning	Do.	112	261
Bathurst Poultry Farm	Do.	105	258
*Chris Goos	Do.	83	255
*R. C. J. Turner	Do.	67	253
Mrs. E. White	Do.	81	253
J. W. Short	Do.	78	253
W. Barron	Do.	99	253
*E. Chester	Do.	94	251
E. Stephenson	Do.	85	243

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	June.	Total.
LIGHT BREEDS—*continued.*			
M. F. Newberry	White Leghorns	80	242
*Thos. Taylor	Do.	84	233
Mrs. E. Z. Cutcliffe	Do.	97	231
H. Stacey	Do.	111	2 9
*E. A. Smith	Do.	82	225
*S. L. Grenier	Do.	86	225
*Mrs. L. Anderson	Do.	81	223
*Haden Poultry Farm	Do.	71	222
*Thos. Eyre	Do.	72	222
*G. Williams	Do.	84	216
*B. Chester	Do.	76	213
*W. and G. W. Hindes	Brown Leghorns	60	209
Linquenda Poultry Farm	White Leghorns	104	195
W. M. Glover	Do.	84	178
Brampton Poultry Farm	Do.	58	162
*H. P. Clarke	Do.	97	162
HEAVY BREEDS.			
Jas. Porter	Black Orpingtons	136	406
T Fanning	Do.	118	377
*T. Hindley	Do.	132	335
*J. Ferguson	Chinese Langshans	115	331
Rev. A. McAllister	Black Orpingtons	125	321
Jas. Avery	Langshans	100	320
*A. E. Walters	Black Orpingtons	104	311
G. Muir	Do.	103	299
Jas. Ryan	Rhode Island Reds	96	297
*R. Burns	Black Orpingtons	120	277
*E. Stephenson	Do.	105	268
*C. C. Dennis	Do.	107	271
R. Holmes	Do.	96	264
*Parisian Poultry Farm	Do.	104	263
*E. F. Dennis	Do.	108	261
W. Becker	Langshans	83	252
*J. Cornwell	Black Orpingtons	99	239
*E. Morris	Do.	62	237
*H. M. Chaille	Do.	82	230
G. Cumming	Do.	98	226
*Mrs. G. Kettle	Do.	106	200
J. W. Newton	Do.	78	183
*A. Shanks	Do.	87	172
*N. A. Singer	Do.	104	161
*J. E. Smith	Do.	79	144
*E. Oakes	Do.	71	133
T. C. Hart	Do.	60	92
F. Harrington	Rhode Island Reds	53	90
Total	...	6,511	17,613

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	60	51	48	64	62	62	347
W. and G. W. Hindes	66	42	57	67	63	32	327
J. M. Manson	45	62	57	46	61	44	315
H Fraser	60	46	54	42	57	50	309
C M P ckering	62	53	45	42	62	42	306
H. C. Towers	55	43	51	41	52	61	303
Mrs. R. Hodge	51	61	57	50	61	22	302
J. Newton	50	59	58	40	55	34	296
W. Becker	46	56	42	41	68	9	262
T. Fanning	50	39	48	42	35	47	261
C. Goos	45	62	9	28	35	76	255
R. C. J. Turner	46	39	35	30	53	50	253
E. Chester	41	49	39	40	39	43	251
Thos. Taylor	32	51	38	22	31	59	233
E. A. Smith	62	34	39	27	31	32	225
S. L. Grenier	36	57	20	39	38	35	225
Mrs L. Anderson	30	44	39	40	42	28	223
Haden Poultry Farm	43	30	33	41	29	46	222
T. Eyre	33	34	26	41	46	42	222
G. Williams	69	41	24	22	28	32	216
B. Chester	26	25	52	32	50	28	213
W. and G. W. Hindes	29	20	22	57	28	53	209
H. P. Clarke	56	20	26	11	19	30	162
HEAVY BREEDS.							
T. Hindley	69	50	57	47	64	48	335
J. Ferguson	59	49	44	61	57	61	331
A. E. Walters	50	61	52	57	34	57	311
R. Burns	22	31	72	24	64	64	277
E. Stephenson	51	40	47	38	40	52	268
C. C. Dennis	58	42	26	53	47	45	271
R. Holmes	32	36	41	50	68	37	264
Parisian Poultry Farm	43	42	40	70	15	53	263
E. F. Dennis	24	53	40	42	38	64	261
J. Cornwell	43	15	44	50	44	43	239
E. Morris	33	51	13	61	40	39	237
H. Chaille	22	55	32	63	47	11	230
Mrs. G. Kettle	26	48	55	10	12	49	200
A. Shanks	9	32	16	35	41	39	172
N. A. S nger	25	16	28	30	14	48	161
J. E. Smith	55	51	24	12	2	0	144
E. Oakes	0	44	19	43	14	13	133

CUTHBERT POTTS,
Principal.

The Orchard.

THE CASSABA.

The cassaba has not yet come into its own in Queensland, though climate and conditions generally are favourable to its successful cultivation. In California it is grown extensively and very profitably. Quite distinct from ordinary rock or water melons, its delicious flavour makes it a very welcome addition to the menu. It is both nutritious and sustaining. In appearance it resembles a hard, heavy, wrinkled melon, and varies in weight, from 10 lb. to 20 lb. The vine is a vigorous grower, its foliage is larger than that of the rock melon, and it is very prolific. The fruit ripens late in autumn and keeps well into winter. If stored in a cool place it will keep much longer. When the soil is not rich it should be well worked and manured. Two

PLATE 9.—CASSABA MELON.

or three seeds should be planted in each hill 12 ft. to 13 ft. apart. The soil should be kept loose around the plant until the vine begins to run, when it should be earthed up. The fruit should be taken from the vine when it has lost its green lustre, but should not be eaten until about a week after it turns yellow. Mr. H. W. Mobsby, of this Department, who introduced the fruit to Queensland from California a few years ago, has a limited quantity of seed for distribution. A small supply will be sent to anyone interested on receipt of a stamped and addressed envelope sent care of the Editor.

GREEN CROP MANURING.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Under the heading of "Intensive Cultivation" I drew attention in the July number of this journal to the very important and frequently unrecognised fact—that the application of commercial fertilisers to the soil is of little value to the crop growing on such soil unless it (the soil) contains sufficient moisture to dissolve the various available plant foods present in such fertilisers, and thus enable the plants which constitute the crop to absorb by means of their root systems the plant foods which are essential to their proper development. It was further pointed out that the capacity of a soil to retain moisture during dry periods depends to a very large extent on the amount of humus or vegetable matter it contains, and systematic green-crop manuring was recommended for soils that are deficient in this constituent.

In the present number it is, therefore, deemed advisable to follow up my remarks which appeared last month with a more detailed account of green-crop manuring, and the benefits to be derived from it, as it is a matter that few fruit and vegetable growers, not to mention agriculturists generally, realise the value and importance of.

The fact that many Queensland soils, especially those that have been under cultivation for some years, are deficient in humus, is shown by the large number of soil analyses that have been made by the Agricultural Chemist, in which the organic matter or humus is low, and in which the power to absorb and retain moisture is also low. Such soils are also usually low in nitrogen, and their capacity for nitrification is poor. This means that no matter how rich a soil is in other plant foods, such as phosphoric acid, potash, or lime, if it is deficient in nitrogen and does not possess the power to retain moisture, owing to a lack of humus, it cannot produce a maximum yield of either fruit, vegetable, or farm crops of any kind. Such a soil cannot make good use of any commercial fertilisers, except in seasons of good and regular rainfall, and even then, if the nitrogen contained in such fertilisers is in the form of organic nitrogen or ammonia, it cannot be made use of by the plant or tree until such time as it has undergone the process of nitrification and been converted into nitric acid, in which form it is readily assimilated. The absence of humus, as already stated, retards nitrification, hence a soil such as described can never be made to yield a maximum return until its deficiency in humus has been made good, and its power to absorb and retain moisture has been increased.

Virgin soils, both scrub and good forest, contain, as a rule, a fair supply of humus, and this, in conjunction with their undepleted supply of plant foods, frequently enables them to produce good crops for a few years, even when given very indifferent attention, and this is due, not only to their supply of available plant food, but to the fact that their friable nature and power to absorb and retain moisture is the result of their having a good supply of humus. As this becomes depleted, the soil becomes firmer and more compact, is less easy to work, and dries out much quicker, so that its yield rapidly decreases, and in extreme cases it is said to be worn out. This unsatisfactory condition of the soil is the result of bad farming; in other words, "improper treatment," whereby it has been depleted of its supply of available plant foods and organic matter, and as no attempt has been made to make good these losses by judicious manuring and thorough cultivation, it has become unproductive.

It is absurd to say that any of our soils are already worn out, and therefore valueless, as many soils that have become unproductive can be brought into a high state of fertility by proper manuring and cultivation.

In the older countries of the world, soils that have been under cultivation for many centuries are still producing good crops; in fact, in many instances the yield is steadily increasing as the result of good farming, which means the maintenance of the soil in a state of perfect tilth and high fertility; so that what has been done and is being done there can easily be done in Queensland if we will employ the same methods as they do.

In warm climates the supply of organic matter in the soil is apt to become more rapidly exhausted than in colder climates, so that there is a greater need to

keep our soils supplied with it, either by the addition of farmyard or other bulky manures rich in organic matter or by the growing of crops suitable for green manuring. Soils rich in oxide of iron also become rapidly depleted in organic matter, and that is one of the reasons why much of our best scrub land, of volcanic origin, though extremely fertile and friable at first, soon becomes much more compact, less easy to work, and less able to withstand a dry spell. Such soils require to be given a regular supply of organic matter to maintain their fertility; in fact, all soils that tend to set hard and dry out soon need treating in a similar manner.

The necessity for green-crop manuring being thus shown, the question arises: What are the best crops to be used for this purpose? Here again the question of soil and climate has to be taken into consideration, as crops that would be very suitable in the granite belt would not be a success in the coastal districts and *vice versâ*. The various crops suitable for green manuring must, therefore, be considered according to their adaptability to the climatic conditions under which they are to be grown, and this will necessitate a brief description of the various crops and the best methods of growing them.

In the first place, the most suitable plants for green manuring are those belonging to the natural order *Leguminosæ*, which includes all the members of the pea and bean families. The suitability of these plants is due, first to the fact that many varieties are very strong growers, producing a large quantity of leaves and stems, which, when added to the soil, either by allowing them to rot on the surface or by ploughing them under, materially increase its organic contents. Further, these plants have the power of obtaining nitrogen from the atmosphere and of storing it in their roots, leaves, and stems, so that when these decay the soil is enriched by their nitrogen contents. This is a very important consideration, as nitrogen is the most expensive essential plant food contained in any fertiliser, and if the soil can be kept supplied in nitrogen by green-crop manuring, then the bill for artificial fertilisers will be considerably decreased. In the late nineties I wrote several articles for this journal descriptive of a number of leguminous plants suitable for green-crop manuring, and including, amongst others, the velvet bean, pigeon-pea, narico beans of sorts (lablabs), Mauritius beans of sorts, small Mauritius beans (*Phaseolus*), cowpeas, and peas of many kinds. Fruitgrowers, however, did not then pay much attention to green-crop manuring, with the result that, with the exception of our sugar-growers, the growing of these plants has not been continued. When visiting Buderim Mountain recently, I saw a young banana plantation, planted with the white narico bean, which had entirely covered the ground and kept down all weed growth, thus saving the owner the cost of chipping the land, and providing a good supply of humus for the soil. A photograph taken by Mr. Mobsby, of this Department, and reproduced herewith, gives a good idea of the growth and of the value of this particular bean for manurial purposes. All the other legumes mentioned did well when tested, some, however, being much more luxuriant growers than others.

The poorest grower was the Black-eyed Susan cowpea, which, though valuable as a pulse, is of little value for manure.

The velvet bean, small and large Mauritius, and all lablabs did well, as did the pigeon-pea, though the latter, being of a more woody nature, takes longer to become incorporated with the soil. Of the cowpeas tested, the black was the strongest grower, and, therefore, most suitable for manure. All these legumes are suitable for coastal districts, and, in addition to them, such crops as broad-leafed Essex rape and white mustard, grown during the winter, are of considerable value.

All the strong-growing legumes should be given plenty of room, such as 18 inches to 2 feet apart in the row, and from 4 to 6 feet apart between the rows. If the soil is in want of manure, they should be given a dressing of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate, or finely ground island phosphate, rich in lime, as this will tend to promote a good growth, and when the green crop is turned under the manurial matter will still be in the soil ready to be made use of by the permanent crop.

The legumes mentioned can be planted in spring as soon as the soil becomes warm enough, but if the spring is a dry one they will make little growth and, further, they will prevent the working of the soil so necessary for conserving moisture. In most cases, therefore, it is better not to plant till the wet season, when they will come away rapidly and soon cover up the land, thus checking and, when their growth is strong, preventing weed growth. Planted at this time, they are not likely to exhaust the soil moisture; and the permanent crops, such as bananas, between which they are planted, will not be injured. The soils of the granite belt, where the majority of our deciduous fruits are produced, are frequently very deficient in humus and low in nitrogen, consequently green manuring is a very necessary operation. The crops most suitable for this purpose are the grey or partridge field pea, rape, mustard, and possibly *Trifolium incarnatum*, or crimson clover, which should thrive in this climate and produce a heavy crop in spring that could be ploughed under. All these crops should be sown in the autumn as soon as the fruit has been gathered; and, even though they may be trodden on during the

PLATE 10.—LABLAB BEAN.

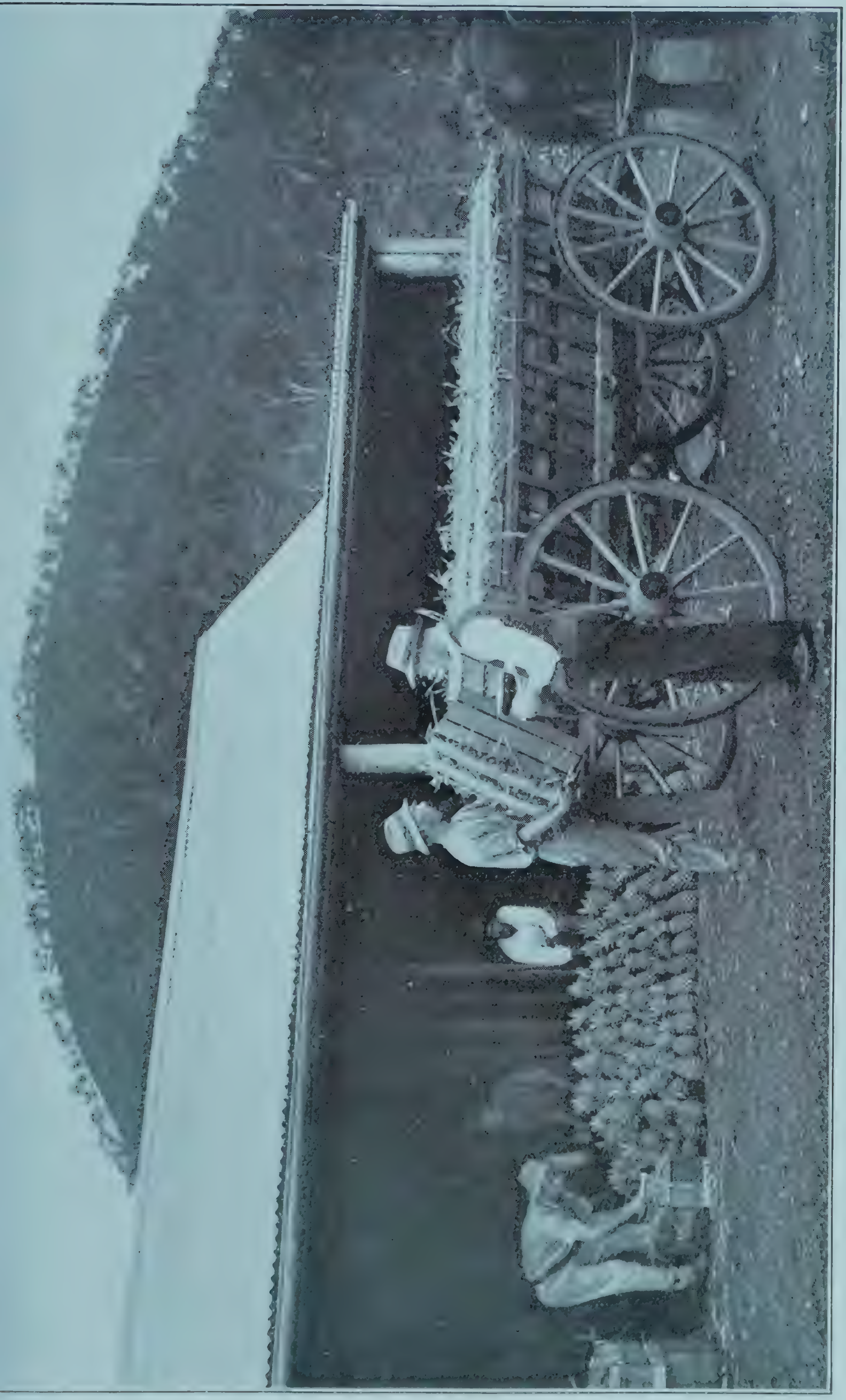


Photo. Dept. Agriculture and Stock.]

PLATE 11.—PINEAPPLE-GROWING ON BEERBURRUM.

Packing, Loading for Rail, and Tallying the Soldiers' Pineapples for Market. Grown on the "State Farm," near Railway, Instructor Burnett in charge. The pines in picture averaged about 6 lb. each in weight. Beerburrum Mountain in the background.

pruning and spraying of the orchard, they will still produce a good quantity of organic matter and nitrogen. In the case of the granite soils of this district, the application of a good dressing of island phosphate, rich in lime, will be of great benefit to the green crop, and although the soil contains sufficient potash for slow-growing plants, such as fruit trees, the addition of 1 cwt. per acre of sulphate of potash to 4 or 5 cwt. of island phosphate will materially increase the yield of the green crop, and, as the manurial matter is not likely to be washed out of the soil, it will be available for the following crop of fruit, vegetables, or other crop that may be planted. In this area, green-crop manuring, combined with the application of slowly acting phosphate manures rich in lime is, in my opinion, the cheapest and best way of maintaining the fertility of the soil.

The growing of crops for green manuring is not necessarily confined to established orchards or plantations, but it is admirably adapted for improving and renovating land that has been kept too long under one kind of crop, and has become unproductive in consequence. Land of this nature should be thoroughly prepared by deep and intense cultivation, and be planted with a strong-growing legume which has been heavily manured as previously described, and when the crop has made its maximum growth it should be ploughed into the soil, which, once the green crop has become thoroughly incorporated with it, will be in a good heart to grow any crop.

ORANGE WINE.

With the advent of the orange harvest, numerous requests reach us from correspondents for directions as to how to make orange wine. We have already given some good recipes for making this beverage, but here is one we take from the Natal "Agricultural Journal," by one who every year makes this wine, and who finds a ready sale for it at 15s. per dozen:—

Cask of Orange Wine (30 gallon cask).—1,200 oranges at 1s. per 100, 12s.; 120 lb. of sugar, £1 5s. Skin the oranges and press the juice out. Soak the pulp in water for seven days, and frequently stir and press. Add the extract to the juice, pour the mixture into the cask. Pour boiling water on the sugar until all is reduced to a syrup, when it is added to the cask, and the vacant space is filled with hot water. When the temperature is lukewarm add a little yeast, and at the expiration of three weeks fermentation should be finished. During the three weeks of fermentation liquor must be added to the cask so that it remains full, for a quantity of sediment will bubble over. When there are no more bubbles, 2 oz. of isinglass should be dissolved in some of the warmed liquor and added to the cask. The bung may now be fastened down. The tap is put in 2 inches from the bottom of the front head. At the end of a month the contents should be ready for drawing off. The cost will be 1s. 3d. per gallon, or 2½d. per reputed quart bottle, and the drink will be in great request. If the liquor is to be kept for any length of time, 1 oz. of salicylic acid should be added at the same time as the isinglass. The salicylic acid will act as a preservative, and prevent the liquor turning sour; but the best means of preserving the contents is to keep the cask full.

ANOTHER METHOD.

Gather the fruit when ripe. Peel the oranges. Put into a vessel with the head out and a tap fitted near the bottom. Pour on boiling water to cover it. Mash the pulp with your hands, and then let the mass stand till the pulp rises to the top and forms a crust in three or four days. Then draw off the fluid into another vessel, and to every gallon add one pound of sugar. Mix well and put into a cask to work for a week or ten days, and throw off any remaining lees, keeping the cask well filled, especially at the commencement. When the working has ceased, bung it down. It may be bottled after six to twelve months.

Or:—Express all the juice of the oranges in a press; strain. To every gallon of juice add 1 lb. of sugar and half-a-pint of brandy. Pour into a cask, but do not bung until it has done working. Then bung it close for three months, and draw off into another cask. When it is fine, bottle and cork well.

Another recipe, taken from "Farm, Field, and Fireside."—Take half a chest (400) of Seville oranges, pare off the rinds, and put two-thirds of them into 6 gallons of water for 24 hours. Squeeze the oranges through a sieve into a pan, and then throw them into another 6 gallons more of water; and leave them there until the next day. For every gallon of wine, put into the cask 3½lb. of loaf sugar, and the liquor strained clear from the rinds and the pulp. Repeatedly wash these, if more liquor should be required to fill up the cask, rather than add raw water. Stir the wine daily until the sugar is completely dissolved, and allow it to ferment for about five weeks. Add three bottles of brandy, stop down, and after twelve months bottle.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

COLVILLEA RACEMOSA.

NATURAL ORDER LEGUMINOSÆ.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(From "Botanical Magazine," f. 3325.) This truly splendid plant, bearing the name of the late Sir Charles Colville, a former Governor of Mauritius, to whom it was dedicated by its discoverer, is probably a native of the east coast of Africa; but was only seen by Professor Bojer in 1824, in the Bay of Bombatoe, on the western coast of Madagascar, where a single specimen tree was cultivated by the inhabitants. That great naturalist obtained seeds, which he took to Mauritius, where plants were raised and did remarkably well. Its flowering season in Mauritius is April and May; this is approximately its flowering time in Brisbane also.

Description.—Tree 40 to 50 ft. high, somewhat like the *Poinciana regia,* to which it is closely allied, but with a more decided trunk and rather heavier foliage; the bark is reddish-grey, branches long and spreading, the younger ones greenish, rough, with elevated points, this being one of the noticeable differences from the Poinciana, whose branches are tipped light-green and have a pendulous or drooping habit.

Leaves dipinnate, with from twenty to thirty pairs, oblong-oval in their circumference, 2 to 3 ft. long; pinnæ opposite, from 4 to 6 in. long, with twenty to thirty pairs of horizontal leaflets, ½ in. long, shorter at the base and at the extremity of the pinnæ, rather unequal, on very short petioles, slightly pubescent. The common petiole is swollen at the base, channelled above, also pubescent; this latter provides the whole petiole with a dull-brownish tint, contrasting with the bright green of that of the *Poinciana regia;* the leaflets also being slightly larger gives the heavier appearance.

Flowers bright orange-red, racemose; racemes from four to sixteen in a large terminal panicle from 12 to 18 in. long, borne on extreme end of branches. The buds are obliquely globose, velvety red; calyx greenish within, including the wings and keel; this latter is small, convolute, almost covered by the wings, and is of a yellowish colour, marked with veins. The ten free stamens are also of a yellowish colour.

Pod from 7 to 9 in. in length, from 2 to 2½ in. in breadth, carrying from six to nine seeds, the whole resembling the *Poinciana regia* pod, but on a much smaller scale.

The great weight of the racemes of flower, being on extremities, bend the branches down during the flowering season. This gives them a graceful appearance, and its striking colour attracts universal attention.

A fine specimen, near the Botanic Museum building, flowered recently and brought the remark from a visitor, Professor E. H. Wilson, Arnold Arboretum, Harvard University, U.S.A., "that is was worth coming all the way from America to see."

Propagation.—Unfortunately, unlike the *Poinciana regia* that flowers in summer, the *Colvillea,* flowering as it does in late autumn, does not produce seed owing to the cold weather intervening. Two years ago a number of pods set, but unfortunately fell off while immature. The difficulty of obtaining seed accounts for the rarity of the tree in Queensland. There are two good specimens in the Botanic Gardens, a medium-sized one in Edward street, at the corner of Margaret street, in front of the Harbours and Rivers Department building, and a small one in Bowen Park. We

PLATE 12.—COLVILLEA RACEMOSA.
Flowers bright orange-red. The branch figured was about 3 ft. 6 in. long.

are endeavouring to get seeds from abroad with the hope of raising a few plants for distribution to our Northern botanic gardens, such as Rockhampton and Townsville, where, if the tree grows, it should set seed readily, thus ensuring a supply for local gardens.

Professor M. Bojer, who named *Colvillea racemosa,* was Professor of Botany at the Royal College of St. Louis, Mauritius. He published a "Flora of the Mauritius" in 1837. It was during a visit to Madagascar that he discovered and named both *Colvillea racemosa* and *Poinciana regia.*

HORTICULTURAL NOTES.

This has been rather an exceptional season, and winter's cold is not yet in evidence. Showery weather continuing through June and July has given a remarkable growth of vegetation for this time of the year. Grass is needing more attention than usual, and weeds are troublesome. The cold necessary for the checking of insect pests and the growth of winter annuals is late in coming. This has particularly affected the growth of sweet peas, stocks, and phlox, besides others, more especially on undrained soils or low-lying situations, by making the soil sour. This can be improved to some extent by keeping the surface well stirred and not allowing it to cake.

The pruning of shrubs and creepers should now receive attention. Prune hard *Lagerstrœmias* (Brugmansia and Poinsettia), the latter after they have dropped their red bracts. Hibiscus and ligustrums can be pruned lightly, but this depends to some extent on the room available and the size of plant desired. Acalyphas also may be pruned, remembering that if they are pruned hard it induces a lot of strong growth that is not always as nicely coloured as that not quite so robust. Wistarias also are much improved by pruning, more flower being obtained. This applies, too, to *Antigonon leptopus,* better and more abundant blooms being obtained if most of the small growth is removed and the main stems and laterals are tied in the direction desired.

Cuttings of shrubs and climbers may now be planted; get good medium wood. If hedges are required, now is a good time to plant. The small red acalypha, *A. compacta,* is very suitable for small garden hedges; put the cuttings in permanent position about 18 in. apart.

Bulbs of hippeastrum, crinum, and plants of agapanthus and clivias may be lifted and replanted if necessary.

Plant cuttings of begonias, coleus, and iresine; coleus seed, also aster and other summer-flowering annuals such as amaranthus, cockscombs, celosia, cosmos, annual chrysanthemum, coreopsis, calliopsis, marigold, and portulacca.

PNEUMATIC GRAIN UNLOADERS.

Pneumatic plants for discharging grain from ships have come largely into use during recent years on account of the saving in manual labour for handling and trimming, and also because of the comparative absence of dust. During the war a number of self-contained floating grain plants were supplied by a British firm to the French Government to handle the increased imports of grain necessary owing to the reduction of agriculture in France. The same firm recently constructed a similar floating plant with the large capacity of 180 tons per hour. It is a combination of pneumatic and band conveyors for simultaneously discharging from a grain ship through spouts to lighters and by means of the band conveyor across the deck of the ship to bands below the quay. The plant is erected on a pontoon which is brought alongside the ship to be emptied. Although designed for 180 tons per hour, this equipment proved able, on a recent test, to discharge at the rate of 200 tons per hour, the highest capacity being 216 tons per hour for two consecutive hours.

Tropical Industries.

THE CANE CROP.

FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (8th July, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

In the course of the month the districts of Bingera, Gin Gin, and Childers have been visited; also Goodwood and Dallarnil. At Bingera, the cane looks promising. The plant and ratoon crops are both well grown and healthy. Young autumn plant cane has struck strongly. Cane pests appear to be well under control, especially the moth-borer. The fact is due, probably, to the large numbers of ants found in the canefields, which are, apparently, their most effective natural enemy. Grubs are also well under control. This may be due to the fact that they are living on organic matter in the soil and leaving the cane roots alone (although not many grubs are found) or that bacterial agencies are destroying them. The cane this year is very suitable in most cases for plants. There are occasional blocks, however, which display unhealthy characteristics. These should be avoided by the farmer as far as planting is involved, and only cane displaying the best appearance should be selected. The leaf-hopper is everywhere present, although apparently well under control.

The darker soil could be limed. More green manuring is essential, especially before using chemical fertilisers. In ploughing-in green crops, the growers should get to work before the seed ripens and when they have the greatest mass of green crops on the field. This restores to the soil the maximum amount of nitrogen and humus the crop can supply.

At Gin Gin the cane crops are excellent. Since the hurricane the cane has made wonderful growth. The growers are greatly heartened, and speak confidently of this season and the likelihood of a good one in 1922.

No disease of consequence is apparent. The effect of the drought is still noticeable in the leaf of the older crops, but this must not be confused by the grower with striped-leaf disease. Pests are also well under control, either by active farming or natural enemies. The moth-borer is attacking the cane in places, but is here again checked by the ants. Taking the district as it is now, the briefest mention need be made of cane pests.

The two most satisfactory varieties are D. 1135 and M. 1900. Both will cut heavily this year, and, judging by the sugar content at Show time, should yield a high percentage of c.c.s.

Farmers, at the time of visiting, were busy breaking up land prior to the spring planting. Should the winter be as mild as anticipated, they ought to be able to plant by the end of July.

At Childers the cane has made heavy growth in the last three months, and some of the twenty-months-old D. 1155 will cut 60 tons to the acre. The cultivation is very good here this year, and the farms are free of weeds. The autumn plant crop has struck well, even misses supplied as late as June coming up vigorously.

D. 1135 and M. 1900 Seedling are the principal canes grown. Others that present a good appearance are H.Q. 77, M. 87, Q. 813, Rappoe, Striped Singapore, and H.Q. 285. Of the newly distributed varieties, E.K. 1, E.K. 28, and Shahjahanpur No. 10 have struck well and are growing vigorously, and are absolutely free from disease. Growers want to bear in mind that the Experiment Stations will not send out cane that is diseased or unsuitable for planting.

Q. 813, another station cane, is doing well, and should be grown by farmers. This variety is a highly resistant cane to disease, and suitable to follow up unsatisfactory crops of D. 1135.

Very little trouble is being caused by cane diseases. An occasional trace of striped leaf disease is evident; also gumming, but there is nothing of an extensive nature.

Peculiarly enough, D. 1135, while a good drought-resister and resistant to grub attack up to a certain point, is a susceptible variety as far as sugarcane diseases are concerned.

This might be on account of the degeneracy of the cane caused by years of careless selection of plants and neglect to change from one soil to another in obtaining supplies of cane for planting.

It should be impressed upon the grower that, whatever cane he prefers to plant, it is essential to select the best type of that variety.

Cane pests are well under control this year. Grubs have destroyed small patches of cane, but the damage is nowhere extensive. Other insect parasites, such as leaf hopper and borer, are doing very little damage. It is worth mentioning that what is thought to be the Muscardine fungus is attacking the grub and causing a high percentage of mortality in the infected areas. A bacterial disease is also in evidence, but the percentages of deaths and the character of the attack could not be observed.

While in the Childers district, a visit was made to Goodwood Plantation, and also to Dallarnil. Very little cane is grown at the latter place, but the soil is suitable if the rain favours the grower. However, several farmers are making efforts to raise crops of sugarcane, and, judging by the appearance of some fields, they have every reason to feel satisfied.

Varieties such as D. 1135, Rappoe, and Striped Singapore are doing well.

Goodwood presents a fine appearance at the present time; in fact, the cane here is equally as good as at Childers. Noxious weeds are not present in any serious growth, while very little trouble is being caused by pests. The land is remarkably free, apparently, from these.

Of the different varieties growing, those displaying the best characteristics include Petit Senneville (a Mauritius variety), Clark's Seedling, D. 1135, H.Q. 77, Black Innis, and M. 1900 Seedling. Green manures could be profitably applied by growers.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. Easterby, states, in the course of a report dated 6th July, 1921, on a recent visit to the Mackay and Bundaberg sugar districts, that since his previous visit the cane had made good progress in each locality, but the Mackay cane was flowering or "arrowing" very largely, and hence little more growth could be hoped for. Not much flowering was observable in the Bundaberg district where the cane, due to the favourable weather conditions, is still making progress.

At Mackay heavy rain fell, ranging from 5½ to 11 inches, in different parts of the district. Unfortunately, this was accompanied by a severe gale, which laid a good deal of the high cane over, and in some instances flattened it considerably. The weather at Mackay has, in common with most other districts, been very much warmer during the past three months than for the corresponding period of 1920. Some of the mills intended to start crushing in July, while the remainder will start early in August.

The Annual Field Day of the Mackay Experiment Station was held on Saturday, 2nd July, and it proved a very great success. About 250 farmers attended, and these were shown over the station grounds, and the various experiments in cultivation and fertilising were explained. The merits and demerits of a large number of varieties imported from different parts of the world were discussed and arrangements made for supplying cane farmers with free parcels of the best kinds. After luncheon, the General Superintendent delivered an address upon the necessity for increasing our sugar production, and the best methods of achieving this were fully set forth. The demonstration of improved farm implements, owing to the wet nature of the ground from the heavy rain, had to be reluctantly abandoned, but one or two of the lighter tillage implements were shown in action. Farmers were intensely interested in the day's proceedings, and acknowledged having spent a pleasant and instructive time.

At Bundaberg, two of the mills had already started crushing operations.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 14th July, 1921:—

BABINDA.—In last month's notes I omitted to mention that among the varieties grown in the district, D. 1135 has to be included. This cane has mostly been grown in grubby areas, and so far has proved its value, showing up remarkably green and healthy in comparison to other varieties that are more badly affected by the ravages of grubs. A larger area of this useful cane is sure to be planted if the grubs continue to do damage.

On the newer portions of this district visited, some magnificent Badila cane was found on the block formerly known as the Q. N. Bank Estate, situated on the south side of the Russell River. A block of 37 acres of plant cane growing there will cut between 50 and 60 tons to the acre. Some of the first ratoons on this block are also very forward. This particular part of the area carries a rich deep alluvial soil formerly under dense tropical scrub. In visiting this district one cannot help noticing how very much it has grown lately. Large areas of land are being grubbed and ploughed in every direction, and the general air of prosperity is very marked. New homes are being erected everywhere.

CAIRNS DISTRICT.—In this district, Freshwater now comprises the areas formerly known as Redlynch and Smithfield, and consists of deep, rich, dark-red volcanic soils and magnificent alluvial flats adjacent to the Barron River and Freshwater Creek. Most of it has not been under crop for a number of years, and in the interval has been growing heavy crops of lantana, blady grass, or burrs. When cleared and ploughed, its possibilities for canegrowing become evident.

On the northern side of the Barron large areas are now being prepared for cane. A great deal of work has been done in building a temporary low-level bridge over the river, and supplementing the mill supply of rails by about a mile of private tramline composed of 3 in. by 3 in. wooden (Pender) rails. Large areas are being planted. Further up Freshwater Creek the same evidences of activity are to be observed in all directions, and 1922 should mark a great increase in prosperity for this rich area.

Redlynch and Freshwater are now very busy places, and old residents begin to think that at last the rich lands of this locality will be able to show what they are capable of producing in the way of sugarcane. Very few grubs were noticed in this particular part of the area, and the cane seed (practically all Badila) looks very green and healthy.

ALOOMBA AND GORDONVALE.—These districts are now in full swing harvesting their crops. Badila composes about 90 per cent. of the cane grown, with about 4 per cent. each of D. 1135 and H.Q. 426; whilst the Gorus 24, 24 A, and 24 B, and 1900 Seedling account for the other 2 per cent. Quite a number of growers who have suffered from grubs this year expressed their intention of planting a larger area of D. 1135 this planting, as they are satisfied that it stands up to the grubs better than any of the other areas.

Some of the cane now being harvested is being sent in to the mill in anything but a clean state, trash and tops being very noticeable.

Owing to the floods earlier in the year, and, later on, to the grubs, the tonnage of the two local mills will be considerably below the original estimates. The shortage from these causes will probably be in the vicinity of 45,000 tons for the two mills. Grubs have caused damage to farms previously free from them. It is considered by some farmers that, had the beetle and grub fund been kept in constant operation all over the district, damage this season would, probably, not have been so severe. In support of this assumption, Mr. Scanlon, near White Rock, tells me that he picked up all the grubs on one block after each successive ploughing. This and the adjoining area were all planted with Badila at about the same time, but whilst all of it shows the presence of grubs, this particular block did not fall down until much later than the others, and has most certainly suffered far less. Apart from the damaged stuff, some splendid fields of cane are to be seen all over the district, and some very heavy yields per acre will be cut this season. At time of writing, several days' rain had been experienced. This fall will help the recently planted cane along nicely, and also keep the grubby cane alive. Quite a large number of tractors are in use in this district, and are credited with doing very good work. Liming, green manuring, and artificial fertilising are being very freely carried out.

MOSSMAN DISTRICT.—When this district was visited, wet conditions prevailed. The rain ceased before the commencement of the crushing. The cane generally looks very green, but might be more advanced.

The cane grown, and the proportion of the same to the total crop to be harvested should, approximately, be as follows:—

Badila	19 per cent.
H.Q. 426	22 per cent.
D. 1135	42 per cent.
Others	17 per cent.
	100 per cent.

By these figures it will be seen that D. 1135 is the most popular variety of cane grown, and some good crops are often harvested here. The crops listed as under were cut on one particular block in the vicinity of the mills:—

Standover Plant	56 tons per acre
1st Ratoons	31 tons per acre
2nd Ratoons	27 tons per acre
3rd Ratoons	25 tons per acre
4th Ratoons	20 tons per acre

while the crop now being harvested promises a 25-ton yield.

Badila and H.Q. 426 are not doing too well, on the whole, although in some places good crops of these varieties are standing.

Of the Gorus, some very fair 24 B may be seen. Of other varieties, Messrs. Crees Bros. planted some twenty new kinds last year upon medium-quality land liable to flood. During the early part of the year flood waters considerably damaged this block, several varieties being quite spoilt. Of the varieties that suffered least, M.Q. 1 and M.Q. 5 (Mowbray seedlings) are doing by far the best, showing a good length of cane, a fair number of sticks, and a splendid green top. H.Q. 903 has also grown very well here, but Q. 813 and Q. 855 have not done so well. All through the district grubs are to be found in places, but cannot be classed as bad, on an average of the whole crop.

Soils consist mainly of a greyish to brown alluvial, varying considerably in depth and covering in most places a stiffish clayey subsoil, and in others a sandy subsoil. A very strong acid reaction is noticed in the soil samples taken. This is due to the continued growth of cane upon the same land, and also helped by the use of artificial fertilisers, such as sulphate of ammonia. Meatworks manure and sulphate of ammonia are at present the principal manures in use in this area. The use of lime would be of much advantage to these soils, but, unfortunately, its cost has so far made its general use prohibitive. Green manuring in the shape of Mauritius beans and cowpeas is giving very good results.

Taking the district as a whole, a large area of very fair land is still available for growing cane, and, as the mill has suffered from a shortage for a number of years, it is a great pity that this land is not being utilised.

After finishing the Mossman district proper, a day was spent at the 7-Mile on "Mowbray." Some very good deep alluvial soil is found adjacent to the river and creeks. Very heavy crops of 24 B and Badila were observed. On Mr. Robin's farm some of the local seedlings are showing very good growth, notably No. 1 Mowbray Seedling, which, although planted at the end of last November, carried some 8 ft. of cane, and should easily cut a 40-ton crop.

CANE ARROWING.

By H. T. EASTERBY, General Superintendent, Sugar Bureau.

The condition which produces what, after all, is but the natural functioning of the cane plant—namely, arrowing, flowering, tasselling, or spearing, as it is variously termed—is not yet generally understood, but it is mostly attributed to climatic factors. On very poor soils, arrowing is frequently common, but this does not apply to the large percentage of arrowing which is taking place this year. In the hotter cane areas, such as Java, Cuba, Hawaii, and North Queensland, arrowing is more or less universal, and as a large production of sugar takes place in these countries, arrowing is accepted as the common thing, and little or no comment is made on the matter. In Mackay and the Southern cane areas the arrows usually take a much longer time to mature, *i.e.*, to become "fluffy" and blow away with the wind, and this is a good point in one way, as it takes the cane longer to mature, but it is a great obstacle in trying to raise seed from the arrow. For many years, endeavours were made at the Mackay Sugar Experiment Station to raise seed from cane, but the arows took too long to ripen, and the arrows from the different varieties of cane did not all ripen at the one time, so that cross-fertilisation could not take place. About Cairns, where the arrows mature quickly, seedling work has been carried out with great success.

Experiments carried out in Hawaii many years ago showed that arrowed cane did not lose its sugar content, provided it was crushed as rapidly as possible. It has been further argued that arrowed cane did not make good plants, but experiments carried out at the Sugar Experiment Station at Mackay, using arrowed and non-arrowed plants of the same variety and age, actually gave a slight yield in favour of the arrowed plants in both the plant and first ratoon crops. As more sugar is extracted in the Ingham-Mourilyan district (where arrowing is usual) from a lower

tonnage of cane than anywhere else in Queensland, except the Lower Burdekin, the arrowing conditions need not be greatly feared. If there should be any decrease in the average sugar contents of the cane this year, it is far more likely to be due to the great amount of rain experienced so late in the season than to arrowing conditions.

Noel Deerr, in his work on "Cane Sugar," says:—

"Arrowing marks the end of the vegetative period of the growing cane. It has been thought that arrowing had an influence on the sugar content of the cane; definite experiments by Harrison and by Prinsen Geerligs have shown that this belief is unfounded. After the cane has arrowed, no further formation of sugar takes place, but an elaboration of that already formed obtains, with an increase in the cane-sugar content and in the purity; eventually, however, the cane dies down, and then a breaking down of the cane sugar occurs. The time to which cane can be left standing after arrowing is very variable, and is dependent on variety and climate. In the Hawaiian Islands, cane may remain as long as six months after arrowing, before deterioration sets in."

THE ALGAROBA TREE IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Instructor in Agriculture.

The contribution appearing in the June issue of the Journal, by Mr. C. T. White, F.L.S., Government Botanist, on the Algaroba Bean, will no doubt be an incentive for many to plant this useful tree.

The writer, as far back as 1900, pointed out its value as a fodder through the medium of the Journal. The results following that article were rather surprising, for in a very short time over 300 applications for seed came to hand. Although those requests were complied with, the results accruing from the seed distributed have been disappointing. So far, I have not seen any trees in the districts adjacent to the coast that have been raised from seed sent out at that time. From reports received, the failures in most instances were due to the difficulties experienced in germinating the seed. Quite a number stated that their plants died when transplanted.

As a result of a later distribution of Algaroba seed, trees are to be found in several localities throughout Central Queensland. Mr. E. Brotherton, Gladstone, has a tree in bearing, seeds of which have been advertised for sale in the Journal. There are several trees growing on the property of Mr. Hugo Tooker, Cawarral, Yeppoon Line, one of which bore its first crop last season. Mr. M. E. Huntly, Mount Larcom, has also two trees about seven years old. They have produced two heavy crops of beans.

Some nine months ago, Mr. Huntly very kindly supplied me with a quantity of seed, which I distributed, with instructions to soak in boiling water before planting. From information received, seed treated in this manner gave good germination, while untreated seed had so far given negative results.

Judging by the rapid growth made by the trees in the districts mentioned, together with their heavy cropping qualities when in bearing, conditions in Central Queensland are eminently favourable for the raising of the Algaroba Bean.

BANANA PLANT FIBRE.

The commercial possibilities of banana plant fibre has engaged the attention of planters and others interested from time to time, and some Tweed River growers have had under consideration the formation of a syndicate to thoroughly explore those possibilities.

A number of banana-fibre products have been submitted to our inspection, and as samples they appeared to be all that could be desired. A textile product woven from processed fibre had a fine silky appearance, and its value as a possible substitute

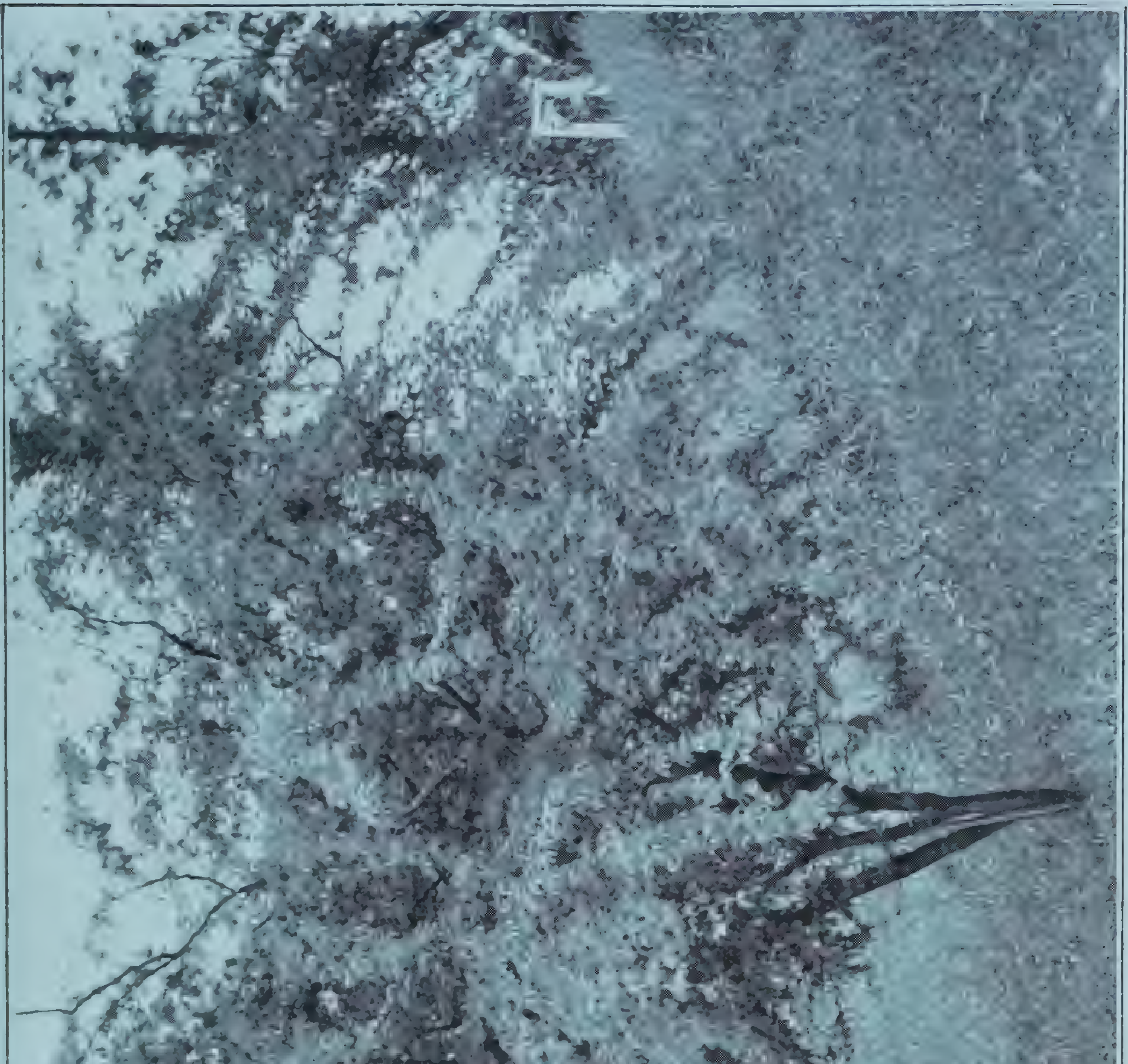


PLATE 13.—ALGAROBA BEAN, BOTANIC GARDENS, BRISBANE.

Photo. Dept. Agriculture and Stock.]

for panama hat material was suggested. Another possibility is the production of vegetable silk from the residue of the treated material after the fibre has been extracted.

The question of the value of fibre from the stem of the banana is a recurring one, and should be approached with all due caution. In the West Indies many years ago, Sir D. Morris, D.Sc., D.C.L., F.L.S., Director of Public Gardens and Plantations, Jamaica, devoted close attention to it. One of his successors, William Fawcett, B.Sc., F.L.S., in his work, "The Banana: Its Cultivation, Distribution, and Commercial Uses" (1913), p. 151, says—

"The stem (banana) yields less than 1½ per cent. of its weight; that is, about 1½ lb. per ordinary stem as cut. . . . To obtain 1 ton of fibre it would therefore be necessary to handle nearly 100 tons of fresh stems, which must be dealt with as soon as cut, on the spot. . . . It is considered that the value, as manure, of the chopped stem is perhaps two or three times the value of the fibre. No reasonable person would wish to export fibre to the detriment of his land. . . . The banana and plantain are grown primarily for the fruit, and not for fibre.

"In 1905, when the subject was under discussion, Sir D. Morris sent the following communication to the Jamaica Agricultural Society (Jour. Jam. Ag. Soc., X. 2, 1906):—'I enclose a summary of the facts obtained as the result of experiments during the last twenty years. They are as follow:—A banana stem just after fruiting, if cut, as usual with the country people, about 2 ft. above ground, and denuded of its foliage, weighed 108 lb.; this being divided into three lengths of 2½ ft. each, and split longitudinally into several pieces, was prepared by beating and washing by hand, and yielded 25 oz. of clean marketable fibre, which is at the rate of 1.44 per cent. of the gross weight. The fibre of the lower portion of the stem, as also the fibre in the petioles of the leaves, was not extracted.

" 'A smaller banana, cut under similar circumstances . . . weighed 41 lb. This was divided into two lengths of 2½ ft. each, and, after being split longitudinally into several pieces, was prepared by hand, and yielded 6¾ oz. of clean fibre, or at the rate of 1.02 per cent. on the gross weight.

" 'At the Hope Plantation, similar experiments were conducted with banana stems, which yielded very much the same results. Two banana stems, cut after fruiting at 2 ft. from the ground, and denuded of their leaves, weighed 147 lb. These yielded 33 oz. of clean fibre, or at the rate of 1.44 per cent. on the gross weight.

" 'From ordinary stems of banana, cut after fruiting at about 1½ to 2 ft. above ground, a settler might prepare about 1½ lb. of clean fibre; but if the stems are large, and the whole of the length is used as well as the petioles of the leaves, the amount of the fibre might be increased to 2½ lb., if not 3 lb., per stem. . . .

" 'It must be borne in mind that to obtain 1 ton of banana fibre it will be necessary to handle nearly 100 tons of fresh stems. These cannot be carried to a central place for treatment, as the cost of the fibre would be increased beyond its market value. The stems will be required to be dealt with on the spot. . . .' "

SUCCESSFUL BRITISH TRACTORS.

The merits of the British-made tractor for agricultural purposes were conclusively demonstrated during a trial on a rubber estate in the Far East. All conditions were against success. The soil consisted of heavy sand or of sand mixed with clay, and rain had fallen heavily prior to the trial. Nevertheless, the driver was able to turn and manœuvre with the greatest ease. Further, the tractor showed its hauling powers by pulling two large trucks, weighing about 11 tons, up hill.

STORING APPLES IN GAS.

In storing apples there is a very interesting alternative to cold storage, known as "gas storage." The apples are placed in an airtight chamber filled with the gas produced by the respiration of the apples themselves. An electrical instrument is used to determine whether at any time the proportion of carbon dioxide in this gas becomes excessive, and when that condition occurs air is admitted to dilute the gas. The air is kept in slow circulation by its own temperature variations, and means are taken to remove excess of moisture. It is stated that this system doubles the time during which apples can be kept in good condition, and that the cost of working is very much below that of any kind of cold storage. The merits of the system are being closely studied by the British Investigation Board.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 22.

INDIAN HELIOTROPE (*HELIOTROPIUM INDICUM,* Linn.).

Description.—An annual herbaceous weed. 1-3 ft. high, more or less hairy or the older parts glabrous. Leaves ovate, oblique at the base, blade 1½-3 in. long tapering into a leaf-stalk of ½-1¼ in., the leaf-stalk and often the main nerves sprinkled with longish white hairs. Flowering spikes terminal or placed opposite the insertion of a leaf, up to 1 ft. long, the upper part coiled or curved. Flowers numerous, closely packed on one side of the spike, white or bluish. Fruit, consisting of 4 small beaked nutlets, arranged in the form of a mitre, at first separating into pairs and later singly. Single nutlets (''seeds'') 1½-2 lines long.

Distribution.—It is a common plant over the tropics of the world. In Australia it would seem to have been introduced. In his ''Second Census of Australian Plants,'' Baron von Mueller records it for Queensland and the Northern Territory. Of late years it has become very abundant about Rockhampton, and has the appearance of having been introduced there. It has also recently put in an appearance about Bowen, and, according to a correspondent (Rev. N. Michael), it appears to have been accidentally introduced there.

Botanical Name.—*Heliotropium,* from the Greek *helios,* the sun, and *trope,* a turning, from the belief that the flowers are always turned towards the sun; *indicum,* Latin, meaning Indian.

Uses.—W. Dymock, in his ''Vegetable Materia Medica of India,'' states:—''The plant appears to be generally used as a vulnerary in different parts of the world. Of its medicinal properties, Ainslie states:—'The juice of the leaves of this plant, which is a little bitter, the native practitioners apply to painful gumboils and to repel pimples on the face; it is also prescribed as an external application to that species of ophthalmia in which the tarsus is inflamed or excoriated.' '' In Bombay the plant is used as a local application to boils, sores, and the stings of insects and reptiles.

Eradication.—So far it has not asserted itself as a particularly aggressive weed, and eradication by hand-pulling or hoe-chipping should not be difficult. As the plant is an annual, this should be attempted, if possible, before it has had time to ripen any seeds.

NOTES ON SOME NORTH QUEENSLAND WEEDS, Etc.

Writing to the Government Botanist, the Northern Instructor in Agriculture (Mr. N. A. R. Pollock) supplies the following interesting notes about some Northern plants:—

Leucas zeylanica is plentiful in parts of North Queensland; it is eaten greedily by all kinds of stock, and is not looked upon in any way as a pest.

Hyptis suaveolens, or Bell Weed, is a bad pest, and spreads freely. It grows in parts in dense masses to over 6 ft. in height. Nothing seems to touch it except cockatoos, which feed freely on the ripe seeds. The story is that a Chinaman in Cooktown brought it out and grew some in his garden for medicinal purposes. It is such a pest here that its introduction elsewhere needs guarding against.

Both the above plants were figured and described in this Journal for September, 1919.

Rhynchosia australis.—I find stock relish this leguminous vine when it is fairly dry, and I have noticed a cow with about 20 ft. of vine trailing after her and gradually chewing it up until none remained. Legumes in a wild state that stock eat should make available additions to our pastures.

Stylosanthes mucronata, the ''Wild Lucerne'' of the Townsville district. I have this plant under trial in all my districts as far out as Burketown, where it is reported to be doing well. It is proving of immense value on the North Queensland coast. as a mixture in pasturage, but, unfortunately, appears to be of annual habit; a perennial would be worth a good deal more. A figure of this plant will be found in this Journal for August, 1913.

Plate 14.—Indian Heliotrope (*Heliotropium indicum*)

A. Shoot bearing leaves and seeding spikes. B. Nutlets ("seeds"). C. Portion of flowering spike (slightly enlarged). D. Group of four nutlets or "seeds," much enlarged. (A and B reduced to scale).

Forestry.

QUEENSLAND TREES.

BY C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 5.

BLUE BERRY ASH (*ELÆOCARPUS OBOVATUS*).

Common Name.—Blue Berry Ash.

Derivation.—Gk. *elaia,* the olive tree; *karpos,* fruit; obovate from Lat. *obovatus,* reversed egg-shaped (in allusion to the shape of the leaf).

Description.—A tree attaining 120 ft. in height and a barrel diameter of over 3 ft. Barrel often widely flanged at the base. Bark grey, slightly rough but not scaly; when cut, brown, yellow towards sapwood, $\frac{3}{4}$ in. thick on a tree with a barrel diameter of 3 ft. Surface of sapwood pale yellow; sapwood white when cut. After several hours' exposure, the inner surface of the bark and the surface of the sapwood sometimes turn a greenish black colour. Leaf stalks $\frac{1}{6}$-$\frac{1}{4}$ in. long. Leaves alternate, elliptical or narrowly elliptical, often broader towards the apex, rounded or with a blunt point at the apex, mostly gradually narrowed into the stalk, margins often toothed, teeth often distant; leaf blade measurement 2 to $3\frac{1}{2}$ in. in length, twice to thrice as long as broad. Flowers in rather narrow racemes springing from the forks of the leaves or from the scars of fallen leaves, the racemes about as long as the leaves. Stalks of individual flowers from $\frac{1}{10}$ to $\frac{1}{6}$ in. long. Individual flowers about $\frac{1}{6}$ in. long. The outer part of the flower, the calyx, is composed of 5 pointed lobes about the length of the flower. Inserted on the inside of and between the calyx lobes, and about as long as them, are the 5 petals, each of which is split into 6 or 7 narrow teeth at the apex. On the inside of the petals, and shorter than them, are the bristle-like stamens, over 15 in number, surrounding the central, small, egg-shaped ovary. Fruit oval or globular, blue, about $\frac{1}{2}$ in. long, outer part almost succulent, surrounding a rough tuberculate stone which mostly contains a single seed.

Flowering Period.—September.

Distribution.—Confined to Australia. Coastal scrubs of Queensland from the Southern border to Mount Perry (west of Bundaberg and about 60 miles from the coast). New South Wales as far south as Port Jackson (C. Moore).

Uses.—The timber should be useful for indoor work such as fittings and cabinet-making.

References.—*Elæocarpus obovatus,* G. Don, in "General History of the Dichlamydeous Plants." Vol. I., p. 55; Bentham, "Flora Australiensis," Vol. I., p. 281; F. M. Bailey, "Queensland Flora." Part I., p. 163.

Photo. by the Authors.]

PLATE 15.—BLUE BERRY ASH (*Elæocarpus obovatus*).
Ranges eastward of Emu Vale, Killarney District.

Photo. by Dept. of Agriculture and Stock.]

PLATE 16.—BLUE BERRY ASH (*Elæocarpus obovatus*). NATURAL SIZE.

Reading from left to right—Flowering branchlet, fruiting branchlet, seed, and leaf.

Entomology.

GRUBS IN THE CAIRNS DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon cane grub investigations from the Entomologist. Mr. Edmund Jarvis:—

When given charge of this entomological laboratory on the 19th of last month, I naturally endeavoured in the first place to review the cane-grub situation from an economic standpoint, and to summarise as far as possible the results of various activities of this station during the years 1918 to 1921.

Although climatic conditions have been very favourable to the growth of cane, the outlook is anything but encouraging, grubs having appeared in numbers this season at Mulgrave, Highleigh, Hambledon, and elsewhere, on river-flats and places which have for many years past been free from attack; while at Greenhills, that stronghold of the "grub pest," about 300 acres of cane are badly affected.

Such widely spread injury, occurring as it does at a time when the beetles during the last three years have not been collected, and had a chance to breed and multiply a hundredfold, must appear significant.

As a matter of fact, economic entomologists the world over have long recognised the importance of systematically collecting the grubs of many injurious species of root-eating scarabaeidæ.

For instance, in a recent Bulletin (1918) issued by one of the sugar experiment stations of Porto Rico, we read:—"The most successful method of controlling the white grub that has yet been found is that of collecting the grubs and beetles. The method is rather expensive, but it is the only sure way of keeping the pest from increasing." Again, our State Entomologist, Mr. H. Tryon, at a meeting of the Australian Sugar Producers' Association, in Maryborough (1911), stated that "these measures had in the past accomplished very great results. It was only when these measures had been neglected that the grubs had increased to a disastrous extent."

HOW TO USE ARSENIC.

At Gordonvale, during the years 1915-16, I studied the effect upon cane-grubs of several deadly poisons administered in various ways, and, after demonstrating the extreme resistance of our cane-grubs to stomach poisons, ultimately found that the only way to secure a high percentage of mortality was to induce them to devour some palatable bait liberally treated with the poison in concentrated form.

Paris green and white arsenic gave the best results, the former arsenical proving the more deadly of the two (see Bulletin No. 4). A field experiment along these lines was conducted by the writer in February, 1917, when a bait consisting of cow-pea foliage dusted with the above arsenicals at rate of 24 lb. to the acre was turned into the soil against the stools, the results being decidedly encouraging (see "Australian Sugar Journal," vol. IX., p. 230). Later, in 1919, when the cane on our Meringa experiment plots was harvested, it transpired that the highest yield (29.400 tons per acre) was obtained from Block 10, which was treated with white arsenic at rate of 10 lb. per acre, dusted on wet Mauritius beans and ploughed in; while the lowest yield (16.658 tons per acre) was derived from an application of sodium arsenate, sprayed in drills at rate of 10 lb. per acre. The above results appear to justify conclusions arrived at in 1915-16, and to indicate that arsenic, to be effective, should be administered as far as possible in a concentrated form; moreover, heavy rain tends to wash the minute particles of arsenic downwards, thereby causing additional and far greater soil adulteration. When laying out future experiment plots of this kind, it is proposed to institute a number of methods of administering arsenic that have not hitherto been tried in the field. Other forms of control will be reviewed in future monthly reports.

LOCALITIES VISITED.

On 30th May a visit was made to Hambleton Plantation, where, owing to the courtesy of Mr. F. C. P. Curlewis, I was able to have a look at some of the cane farms and note degrees of grub infestation. It was interesting to find that D.1135, which at first had appeared likely to resist attack in that locality, was finally succumbing in several places, and fast turning yellow. A block of this variety, planted June, 1920, had shown the first indication of grubs the following April, and is not expected to cut over 20 tons. A late block of the same variety, planted in September, went down in March; and 8 acres of Clark's seedling, planted at the same time, collapsed during May, and might cut 5 tons, although in January (about five months after planting) it had every appearance of being a 30-ton crop.

Mr. Curlewis directed my attention to one of those problems so full of interest to the entomologist, the solution of which might at any time throw considerable light on the question of cane-grub control. This was a 15-acre block of H.Q.426, June planting, that was stunted, and for the most part badly grub-eaten—having dropped from an anticipated yield of 30 to about 15 tons—while right alongside it, on similar soil, stood a small block of D.1135, planted the same month, but apparently free from grubs, the sticks being 7 to 9 ft. high, and promising about a 25-ton crop.

Aloomba was visited on the 3rd, and Woree on the 21st instant, when inquiries were made at both places into the reported occurrence in injurious numbers of the beetle borer of cane (*Rhabdocnemis obscurus*, Boisd). In each case, however, these alarms were proved to have been groundless.

CAIRNS SHOW EXHIBIT.

On the 8th instant we exhibited, at Woree, a small collection of insects, &c., comprising eggs, larvæ, pupæ, and adults of our various cane-beetles, together with a number of the parasitic and predaceous enemies, such as digger wasps and robber flies, that help to control the ravages of the grub pest. This display afforded opportunity for getting into touch with canegrowers, and led to much instructive discussion relative to the cane-grub problem.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JUNE, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of Years' Records.	Total Rainfall. June, 1921.	Total Rainfall. June, 1920.
North Coast.	In.		In.	In.
Atherton	1·53	20	2·95	9·32
Cairns	2·72	39	8·12	1·75
Cardwell	2·06	49	2·77	3·13
Cooktown	2·00	45	4·13	1·19
Herberton	0·96	34	2·68	0·94
Ingham	2·37	29	4·94	3·94
Innisfail	6·96	40	10·25	4·22
Mossman	2·20	13	6·41	2·80
Townsville	1·28	50	0·58	1·02
Central Coast.				
Ayr	1·33	34	0·36	1·91
Bowen	1·62	50	0·69	1·24
Charters Towers ...	1·35	39	0·33	0·75
Mackay	2·70	50	2·93	3·07
Proserpine	3·62	18	6·18	3·19
St. Lawrence ...	2·45	50	2·90	2·88
South Coast.				
Biggenden	1·76	22	3·93	2·27
Bundaberg	2·67	38	4·48	2·67
Brisbane	2·65	70	7·98	3·24
Childers	2·13	26	3·86	2·97
Crohamhurst ...	4·13	25	11·05	3·83
Esk	1·93	34	6·29	2·35
Gayndah	1·77	50	6·56	1·96
Gympie	2·45	51	5·57	3·12
Glasshouse M'tains	3·55	13	11·15	4·73
Kilkivan	1·90	42	9·03	2·19
Maryborough ...	2·79	50	3·25	3·44

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of Years' Records.	Total Rainfall. June, 1921.	Total Rainfall. June, 1920.
South Coast—continued:	In.		In.	In.
Nambour	3·21	25	8·59	3·94
Nanango	1·91	39	7·68	3·12
Rockhampton ...	1·92	34	7·07	0·59
Woodford	2·51	34	8·36	2·51
Darling Downs.				
Dalby	1·60	51	5·57	2·12
Emu Vale	1·31	25	4·75	1·61
Jimbour	1·55	33	7·03	1·80
Miles	1·85	36	4·28	1·93
Stanthorpe ...	1·80	48	5·81	4·61
Toowoomba ...	2·28	49	6·56	2·72
Warwick	1·58	34	5·54	2·28
Maranoa.				
Roma	1·64	47	3·80	2·26
State Farms, &c.				
Bungeworgorai ...	1·38	7	3·76	3·19
Gatton College ...	1·55	22	6·08	2·18
Gindie	1·44	22	3·97	1·40
Hermitage ...	1·75	15	5·17	2·15
Kairi	0·79	7	4·45	0·72
Sugar Experiment Station, Mackay	2·34	24	3·00	3·40
Warren	1·15	7	7·17	1·23

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for June this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Science.

DEHYDRATION.

On Tuesday, 5th July, Mr. T. H. Morton, A.M.I.M.E., F.R.G.S., who has had a wide experience of commercial dehydration in the United States of America, and was during the War, supervising engineer in connection with dehydrating plants operated by the Board of Agriculture in England, lectured before a large gathering of members of the Brisbane Chamber of Commerce.

The points made, *inter alia,* by the lecturer were:—

Dehydration is a comparatively modern term, adopted with the evident intention of indicating the use of ultra-modern scientific methods and machinery. The term covers, particularly, the removal of moisture content from the treated product sufficiently to ensure preservation, without damaging the vegetable cells and their moisture ducts, thus enabling their restoration, by soaking, to their original state of freshness.

The art of drying foodstuffs is very ancient, and within comparatively recent years has developed into a science.

The necessity for some suitable apparatus to bring drying more directly under the control of the operator than is possible in the open air, led to the development of various contrivances and processes.

The type of drier giving the best results and, in the lecturer's opinion, one destined to be more generally used in dehydrating fruit, vegetables, and fish, is a special form of tunnel drier.

In earlier tunnel systems a strong current of heated air was drawn or forced from end to end of a tunnel-shaped chamber, along which woven wire trays were slid from end to end on special supporting strips, attached to the sides of the tunnel or conveyed on trucks; the air currents thus flowed longitudinally between the trays in their passage from end to end. One great disadvantage of this system was that the product usually had to finish at the hottest end of the apparatus, and was thus exposed to the risk of scorching or overheating.

An improved type of tunnel system eliminated this disadvantage, by a novel arrangement for circulating the heated air of any desired humidity across the path of progress of the product in its journey through the system from end to end. From this type has been developed the powerful dehydrators constructed and operated by the British Government, and the first high-power, scientifically designed commercial fruit and vegetable dehydrator constructed in Australia.

The factory recently erected at Kendenup (W.A.) by the lecturer, for the De Garis Development Company, showed on its test that the plant exceeded the estimated output and the most sanguine expectations of those directly concerned.

The modern industrial plant erected at Kendenup was completed in fifty-four days, from the laying of the first brick to the delivery of dried fruit, and, in the lecturer's opinion, though not the largest, is the most effective dehydrator in existence.

Queensland, in the lecturer's opinion, offers one of the greatest fields in the world for successful dehydration, on account of the great variety of its fruits and vegetables.

Queensland is importing large quantities of dried fruits and vegetables, while thousands of tons of her own luscious products are being either wholly wasted or sold below cost.

Dehydration on scientific principles will go a long way to solve the recurring market glut problem.

The drying of pineapples is as practicable as drying lemons, and the product will certainly prove profitable.

Dehydrated pineapples can undoubtedly be reconditioned.

Dried fruits, according to housewives, make better jam than fresh fruit.

Large quantities of dried bananas found a ready market in England during the War, and are still in regular demand.

The lecturer was hopeful in respect to the processing of strawberries, but, so far, he had not recommended their treatment on account of their high water content.

There is no need for fear or pessimism in regard to the Australian fruit industry. In the lecturer's opinion the outlook is brighter than ever through the improvement of dehydrating processes.

Modern commercial dehydration will probably never supersede canning, but it has come to stay.

Explaining the working of a dehydrator, the lecturer said that the process includes cleaning, peeling, slicing, or cubing, and placing on conveyors for transit through the dehydrating chambers, where nothing is removed from the product but water. This is done without destroying the cellular structure or affecting the flavour or food value of the product. Currents of clean pure air, at pre-arranged temperatures, are fanned over the fruit, and the resulting product is ready for the storage room and shipment.

The chairman of the Chamber (Mr. Myers King), who presided, referred to the marketing problems that confronted the fruitgrower, and regarded dehydration as something that would immensely aid their solution. By the employment of the process, transport charges would be reduced by seven-eighths. When prohibition was mooted in the United States, the grapegrowers of California collected a large sum of money to oppose the proposal, but American growers are now getting as much again for dried grapes as they were when the freshly picked product was sold for winemaking purposes.

The lecturer submitted for inspection a large number of samples of various fruits and vegetables that had been subjected to the process, the commercial possibilities of which were generally and favourably commented upon.

CONCRETE FLOORS.

Mr. Arthur Morry, surveyor, Department of Agriculture and Stock, supplies the following specification for laying a floor for cow bails with Portland cement concrete, in response to an inquirer:—

The ground to be carefully excavated to a regular surface with a fall of not more than three inches from the front of the bails to the back, any inequalities to be filled up with hard materials and well rammed with a wood or iron rammer.

Before starting to lay the concrete, fix wood screeds at top and bottom of the shed, the bottom screed to be three inches lower than the top one; these screeds to be fixed four inches above the ground line, so that when the concrete is laid, rammed, and ruled off, it will be of a regular thickness of four inches throughout. For ruling off use a long straight edge, with bottom edge shot perfectly true with the plane.

Concrete to be composed of approved Portland cement in the proportion of one cask or three bags to one cubic yard of clean river or creek gravel, with all stones more than one inch in size taken out, or, failing gravel, four parts of broken stone which will pass through one and a-half inch mesh, and two parts sand to one part of cement. This makes a concrete technically known as 4—2—1, but it must be understood that one cubic yard, or twenty-seven feet cube, of dry materials will not make one cubic yard of finished concrete, because the finer materials, such as sand and cement, go to fill up the spaces left in the larger material, such as stone. The shrinkage in finished concrete when rammed is from 23 to 27 per cent. of the dry materials, so that about thirty-one feet of gravel and cement is required for one yard cube of finished concrete.

The most convenient method of measurement is to make a box 3 ft. x 3 ft. x 1 ft. without top or bottom, fill it with gravel or stones and sand, and add one bag of cement; this will give a good mixture. Turn it over twice dry and twice when wet, then place it in position four inches in thickness between the screeds, level off with the straight edge, and well ram until the water comes to the surface. Take care that no holes are left on the surface in which the water can lodge. Do not lay on a coat of cement for finishing, as this very often comes off after a time, but endeavour to get a good face with the rammer. If this is not satisfactory, make a grout of water with equal parts of sand and cement, and stir up well until it is quite thick—too thick to flow. Pour this out on to the floor, and brush it over with a stiff broom, taking care not to leave any lumps or inequalities. This will make a good and durable floor.

The open drain should be made with the same material, with 6 in. x 2 in. curb of hardwood on each side, and it is better finished with the trowel for a smooth face.

One cubic yard of concrete or twenty-seven cubic feet will be sufficient for every eight superficial yards of floor four inches thick. This will require three bags of cement and thirty-one cube feet of dry materials for each cube yard.

What is called ash concrete is sometimes used for the above purpose. It is practically the same mix as the above, i.e., six parts of ashes, with most of the dust taken out, to one part of cement, but it is necessary to make it durable to finish the surface with a ½ inch coating of one cement and one and a half sand, worked up with the wood float or the steel trowel. Wood ashes are to be avoided, as they contain a percentage of potash which is injurious to the cement.

The most durable floors are made as first described.

General Notes.

SEPTEMBER SHOW DATES.

Zillmere A. H. and I. Society: 10th September.

Gympie A. M. and P. Society: 14th and 15th September.

A. and P. Society of Southern Queensland, Beenleigh: 15th and 16th September.

Sherwood Progress Association: 17th September.

Mary Valley P. A. and I. Society, Imbil: 21st and 22nd September.

Rocklea A. and I. Association: 24th September.

Southport A. H. and I. Society: 26th September.

Toombul A. H. and I. Association: 30th September.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom), June.—Professor R. C. Punnett, F.R.S. (University of Cambridge) discusses further the results of research in animal breeding. The third of a series of important articles deals entirely with poultry and rabbits, giving particulars of a most extensive series of experiments undertaken to investigate the inheritance of weight. ''The Progress of Milk Recording'' and the ''Need for a more General Use of Improved Varieties of Seed'' are discussed editorially. Other of the more important features include a paper on ''The Control of Farm Management and some Fundamental Principles of Agricultural Costing,'' by C. S. Orwin, M.A. (Institute of Research in Agricultural Economics, Oxford); ''Simple Cost Accounts for Farmers,'' by Sir A. Daniel Hall, K.C.B., F.R.S. (Chief Scientific Adviser); and ''The Marketing of Fruit,'' by H. V. Taylor, A.R.C.S., B.Sc. (Deputy Controller of Horticulture).

The Tropical Agriculturist (Ceylon) for May, features a paper by Sir Arnold Theiler, K.C.M.G. (Director of Veterinary Education and Research, South Africa), reprinted from the ''Journal of Agriculture, Union of South Africa,'' Vol. II., No. 2, on ''Diseases, Ticks, and Their Eradication.''

The Agricultural Gazette of New South Wales for July has its customary budget of valuable information. Among its main features is the continuation of a paper on ''Producing Lucerne Hay under Irrigation Conditions,'' and describing methods and detailing experiences at the Yanco Experimental Farm, by F. G. Chomley and F. Chaffey. Other notable features are ''Reports of Farmers' Experimental Plots;'' a ''Description of Elephant Grass, or Napier's Fodder,'' by E. Breakwell, B.A., B.Sc. (Agrostologist); a continuation of a discussion on ''The Feeding of Sheep in Times of Drought;'' an article on ''The Modern Cheesecuring Room,'' an interesting competitive comparison by A. T. R. Brown (Assistant Dairy Instructor); ''A New Method of Determining Yields of Experiment Plots,'' by H. Wenholz, B.Sc. (Agr.); and a further contribution on ''The Cause of Black Disease and its Methods of Transmission,'' by Sydney Dodd, D.V.Sc., F.R.C.V.S. (University of Sydney).

Annual Report of The Acting Administrator of The Northern Territory of Australia, 1920.—This report contains much valuable information on conditions in the Territory. On its pastoral possibilities Mr. F. A. C. Bishop, Chief Inspector of Stock, is quoted as follows: ''We have approximately 335,116,800 acres of land carrying less than three-quarters of a million head of stock, when the carrying

capacity of stock in the Territory to-day, if conservation of water was on hand on all areas, should be at least four million head of cattle, and, as the country is essentially a cattle country, no time should be lost in recognising the true facts.'' The report goes on, ''Other authorities have expressed similar views. Here is a certain and safe avenue of development that no time should be lost in exploiting. The great obstacles that have confronted the pastoralists were (*a*) absence of railway communication; (*b*) absence of permanent surface water; (*c*) absence of permanently watered stock routes and camping reserves; (*d*) absence of roads for wheeled traffic; (*e*) inadquate mail services; (*f*) absence of telegraph and telephone lines; (*g*) absence of concerted effort to destroy dingoes and other pests.''

The International Review of the Science and Practice of Agriculture (Rome) for March has an original article on ''Organisation of Agricultural Bookkeeping in Denmark,'' by O. H. Larsen (Professor of Rural Economy). In Denmark, the necessity of giving close attention to farm accounts is widely recognised. Efforts are made to ascertain: (1) Amount of capital invested and manner in which it is allotted to the various agricultural enterprises; (2) comprehensive budget of gross profits, working expenses, net profits and interest on capital employed; (3) book-keeping of the various branches of the industry, showing cost of production, general and working expenses; (4) household expenses; (5) income of farmer and revenue yielded by the enterprise itself.

Among the abstracts is a mass of general agricultural intelligence from world-wide sources.

South African Gardening and Country Life, June, has among its leading features a paper on ''Roses and Rose Growing,'' by A. W. Hazell, whose magnificent rosary at Rondebosch is well known to a large number of ex-members of the A.I.F.

Journal of the Department of Agriculture, Union of South Africa (June).—J. du P. Oosthuizen, M.Sc. (Tobacco and Cotton Experiment Station, Transvaal) deals exhaustively with ''The Improvement of Cotton by Seed Selection,'' and remarks on South Africa's second effort to become a real cotton-producing country. As in Queensland, a first attempt was made as a consequence of the world shortage brought about by the American Civil War, and similar conditions afterwards operated to destroy what promised to become a staple industry.

The Twentieth Annual Report of The Bureau of Agriculture, Government of the Philippine Islands (1921), is a finely and profusely illustrated production, containing much valuable information on tropical products.

The Scientific Australian (Melbourne), 11th June, has an interesting note on ''Prickly-pear—Profitable Uses Suggested,'' in the course of which is described the result of experiments made by Lieut.-Colonel L. W. Bickle, F.R.C.S., now of Sydney, and formerly of Adelaide. ''He claimed that, by a comparatively cheap process, a new human and stock food could be made from prickly-pear.'' Other prickly-pear products include a chaff of ''higher nutritive value than wheaten hay,'' a meal capable of being made into an excellent oil cake, a fibre capable of conversion into pulp felt, or possibly a coarse paper. All these are made by a dry process. His researches also showed the possibility of medicinal uses in chest cases. ''The yield is from 12½ per cent. to 17½ per cent. of the dry products from the green slab or leaf.'' Tables of analyses are quoted to support the Colonel's claim.

VEGETATION DISEASES AND INSECT PESTS.

A chart of vegetation diseases and insect pests, illustrated in colours, is on sale at the Department of Agriculture and Stock, Brisbane, at the nominal price of 2s. 6d. The chart is suitable for framing, and should be a useful adornment for the walls of schools and meeting places of public bodies.

Answers to Correspondents.

THE FOOD AND MEDICINAL VALUE OF FRUIT.

Inquiries having been received by the Department respecting the value of various fruits as food, and also medicinally, the matter has been referred to the Director of Fruit Culture, who reports as follows:—

All fruits are of great value, not only as food, but in many cases on account of their medicinal properties.

In brief, fruit may be said to be Nature's greatest remedy. Taken as a whole, fruits tend to purify the blood, and thus keep the body in a healthy state, but individual fruits have specific medicinal qualities. For instance, grapes are valuable in the convalescent stage of many diseases, as they supply nourishment in a readily available form, and act as a cooling medium that has the effect of counteracting any slight feverish tendencies.

All fruits of the citrus family are valuable medicinally, as they act as a febrifuge in the case of mild fevers, and also as a cooling agent when used as a beverage. They have also strong anti-scorbutic properties, and are therefore very valuable in cases of scurvy, barcoo rot, and other diseases due to impure blood.

Apples are extremely valuable as a food, being easily digested, and therefore suitable for everyone. They are also valuable for their corrective properties, in that they act as an antacid, and are frequently very beneficial in cases of rheumatism and similar diseases.

Bananas are valuable as a food, both in the green and ripe stage. In the former they can be used as a vegetable, or dried and ground into flour, and in the latter they can be used either as a fresh fruit or dried and used when required. As a food, their value is high, owing to their being rich in starch and fruit sugars, both of which are valuable food products. Medicinally, bananas have no very great effect other than that possessed by all fruits—namely, that of tending to keep the body generally healthy.

The food value of pineapples consists mainly in the fruit sugar-content in the juice, but medicinally the juice is very valuable as a remedy in cases of throat affections, and it also acts as a good blood purifier.

All commercial fruits are valuable adjuncts to our daily food, and, did we depend more on their use and less on that of proprietary medicines, it would be better for the health of the community generally.

RED NATAL GRASS.

Inquirer (Loganholm).—Your inquiry was referred to the Government Botanist, Mr. C. T. White, F.L.S., who advises as follows:—"The botanical name of Red Natal Grass is *Tricholaena rosea.* It is a native of the warmer parts of Africa, Madagascar, and Southern Arabia. It was not introduced into Queensland by this Department but by the Acclimatisation Society, who received seeds from Dr. Schomburgh, Director of the Botanic Gardens, Adelaide, South Australia, in 1876, some years before the Department of Agriculture and Stock was formed. For some years afterwards it was grown as an ornamental species, the pretty seed heads being in demand for floral work. As a fodder, reports are somewhat conflicting. However, it is quite a useful grass either for hay or grazing, an objection to it for the latter purpose being that as it has a very slender hold of the ground, stock pull it out by the roots when feeding on it. It is a pest in cultivation areas, but in small patches can be forked out. It will not stand heavy grazing, and for this reason is rarely seen to any extent in places where stock have access, it being most plentiful in cultivation paddocks, railway embankments, &c., so that turning stock on to it will generally eradicate it, not only because they tear up the old plants by the root, but also because they are very fond of the young plants, and in eating them tear them out of the ground which, of course, means their extermination."

The Markets.

PRODUCTION, PROSPECTS, AND PRICES.

The following survey is an abridgment of departmental summaries of conditions, prospects, and prices for the month ended 20th July, 1921:—

AGRICULTURE.

Early in July fairly heavy rains were reported from the whole of Southern Queensland. Freshes occurred in many rivers and creeks. In the Goondiwindi district a large area was again flooded. Heavy rains in maize-growing districts caused a suspension of harvesting operations. Considerable quantities of grain were destroyed. Heavy losses of potatoes also followed on excessive moisture. Haymaking was also retarded by the unfavourable weather. Many lucerne cuts were destroyed by untimely showers. Downs farmers were very active with planting preparations for winter cereals. Provided good growing weather continues the crop future is hopeful enough, but should a dry spring follow, ample yields may not be anticipated. The season generally continues exceptionally mild. Grass and herbage have splendidly responded to the favourable condition for good growth.

The maize market during the first week of July was not altogether favourable to the farmer and supplies were held back. As the week advanced, figures improved and competition became brisker: 4s. 0½d. was the top limit for the period. Lucerne chaff was in full supply to a dull demand with a range from 4s. 5d. to 8s. Heavy consignments of oaten chaff were received from the Border, but local lots were light. The best price was 7s. 9d. A large number of offerings were passed in. Mixed chaff was scarce and sold up to 6s. 10d. Offers from 3s. 9d. to 6s. 3d. were refused. Sweet potatoes were scarce and were quitted at from 2s. 7d. to 3s. 6d. Pumpkins, in light supply, brought 3s. Broom millet prices improved, prime hurl selling at £28 and an inferior quality at £20.

Weather Bureau advices showed the second week was dull and showery over a wide region. Farmers were anxiously awaiting a break. Field operations generally were at a standstill.

Country show reports were very favourable, a high order of excellence in respect to exhibits being attained. Sub-district displays were generally of a high standard. The number of exhibitors was not, however, nearly as large as it might be, and the interest of farmers in their local show as competitors needs, apparently, a general quickening.

Excellent reports continued to come in from the wheat areas, but it was generally recognised that seasonable temperatures are required to check tendency to rankness. Maize was marketed fairly heavily. Some lines were on the soft side. Prices remained at approximately the previous week's level. Lucerne chaff was plentiful, but the demand was listless. A large number of lines were passed in up to 7s. 9d. Sales were effected at 5s. to 9s. Weighty parcels of oaten chaff were received. Border lines sold up to 8s. and local lines to 7s. 4d. Fair samples of mixed chaff were submitted and quitted at from 4s. to 7s. 3d. Potatoes met an improved market; prices, 5s. 3d. to 8s. 7d. Sweet potatoes were still scarce and topped at 3s. 9d. Very little wheat was offered at rates from 6s. 5d. to 7s. 1d. Barley was very scarce, only one line at 4s. 10d. meeting the demand. Broom millet sold at from £21 to £27.

There was little change in the weather conditions for the week ended 20th July. The Darling Downs and other agricultural areas were looking exceptionally well for the time of the year. Early-sown wheat required frost beenfit. It is expected that a fair proportion of this year's crop will be sown late, as growers have found that

dependence may be placed on quick maturing varieties. In the South Coast region arrowroot was ready for harvesting. Operations were delayed by the soddeness of the soil. Arrowroot mills were being put in order. The present price of the finished product is, however, causing disappointment to growers. The maize market improved to a slight extent. Supplies were plentiful, and 4s. 2½d. the favourable limit. Lucerne chaff was again in full supply on a lifeless market. Prime went to 8s. per cwt. The other extreme was 4s. 3d. Trans-Border oaten chaff was again in heavy supply. Local lines were scarce. The best price was 9s. per cwt. Mixed chaff was not so plentiful and sold to 7s. 1d. Sweet potatoes were not on large offer, and only a small quantity of pumpkins was received, 3s. 9d. per cwt. being the top price. Heavy supplies and improved samples of potatoes came in and quitted at from 5s. 6d. to 8s. 1d. Skinless barley found no acceptance. The price for prime broom millet was unaltered. Other qualities showed a decline.

DAIRY PRODUCTS.

Statistices for the dairy industry for four weeks ended 20th July include the following:—

Production.—Quantity submitted for examination for cold storage:—Butter, 32,677 boxes (each, 56 lb.); cheese, 330 crates (each, 142 lb.).

This production may be viewed as surplus over and above local requirements and available for export.

Shipments Interstate.—Butter, 10,718 boxes; cheese, 231 crates.

Shipments Oversea.—Butter, 30,103 boxes.

In Cold Storage on 20th July, 1920.—Butter, 12,387 boxes (approx.); cheese, 489 crates (approx.).

FRUIT.

Excessive rainfall in the orchard areas has either retarded or caused the suspension of seasonal field operations. An exceptionally early spring seems probable as a consequence of an unusually mild and wet winter, and the possibility of late frosts to follow is not a particularly bright anticipation. Many trees and plants are still in vigourous growth; bananas and pines in particular continue to produce good fruits. Vegetables are plentiful on a fairly favourable market. Strawberries are also plentiful and a large quantity is going into preserves. In the course of the week ended 20th July shipments of canned pines were consigned to the United Kingdom. The fruit was packed in accordance with a special arrangement entered into between the Queensland Government and the Federal authorities. Recent examinations of the pack have shown it to be in excellent condition, and the consignment is in all respects equal to that put up by outside competitors. Trial consignments of canned pines, strawberry and other jams, have also been despatched to Asiatic and American markets.

SUGAR.

Harvesting is proceeding smoothly and all mills north of Townsville are now operating. At Mossman showery weather delayed the commencement of cutting, but crushing is now in full swing.

FAT STOCK.

Report for week ended 20th July:—Cattle: 1,060 yarded, including a train load of cows from Longreach and a train load of bullocks from the same trucking centre. The market opened firm and continued so throughout for prime quality. Some cows were only in medium condition and for these the market was irregular. Prime bullock beef was worth from 28s. to 30s., with odd pens of choice quality to 32s. Prime cows quitted at from 20s. to 25s.

Sheep.—6,600 were penned. Two train loads were trucked in from Longreach and Aramac respectively. Most of the sheep were from medium to good trade mutton. The percentage of really prime sheep was small. The market opened firm and remained so throughout. Good trade wether mutton was worth 4½d. to 5d. per lb., and prime quality to 5½d. Ewe mutton sold from 4d. to 4½d.

Farm and Garden Notes for September.

FIELD.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly prepared ground. Therefore, the cultivator and the horse and hand hoe must be kept vigorously at work to check the weed pests and save the growing crops as well as much future labour. Attend to earthing up any crop which may require it. There may possibly occur drying winds, dry weather, and even very late frosts, which have not been unknown in parts of this State even as late as September. Still, good showers may be looked for in October, and much useful work may be done during the present month which will go far to afford a fair prospect of a good return for labour.

The following crops may be sown:—Cotton, maize, for early crop, sweet corn, sorghums, broom millet, cowpea, red and white French millet, giant panicum (liberty millet), Sudan grass, cow cane, Rhodes grass, and paspalum, tobacco, pumpkins, and melons. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, chicory, and ginger. Plant out coffee. Sow cotton—Sea Island near the coast, and Uplands generally. Sow maize, sorghum, imphee, mazzagua, Indian cane, prairie grass, Rhodes grass and paspalum, panicum, tobacco, pumpkins, and melons, including the Cassaba melon. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, ginger, and canaigre, the latter a tuber yielding a valuable tanning substance. Plant out coffee.

KITCHEN GARDEN.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of these, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be of great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly dug beds. What the action of salt is, is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile, and causes hardpan to form. All kinds of beans may be sown in any district. Sow French beans in drills 2 ft. apart and 9 in. between the plants, and runner beans 4 ft. between the rows and 1 ft. 6 in. between the plants. Sow cucumbers, melons, marrows, and squashes. If these are troubled with red beetle, dust the bushes with fine wood ash, or spray with Bordeaux mixture. The latter also prevents injury from fungus. Set out egg plants in rows 3 ft. each way. Tomatoes should be ready to plant out. Train to a single stem by keeping all laterals pinched off. Plant out rosellas, sow mustard, cress, lettuce, carrots, shallots, cabbage, and radishes. Good results can be expected from any of these, providing the ground is kept in good tilth and water and manure supplied.

Orchard Notes for September.

THE COAST DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the Southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as if the trees are not in this condition they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the tree; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by deep and systematic cultivation, excepting in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth, the orchard should be manured with a quick-acting, complete manure; such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods in which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Take great care in the selection of the suckers, and see that they are free from beetle borers or other diseases.

As a precaution it is advisable to cut off all old roots and to dip the corms for two hours in a solution of corrosive sublimate, made by dissolving 1 oz. of this substance in 6 gallons of water.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers.

Where necessary, manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash, 4 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared—viz., brought into a state of perfect tilth to a depth of at least 1 ft., more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bones, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable, passion vines can also be pruned now, as if cut hard back they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed from then till the time the fruit is ready to colour with bordeaux mixture, in order to prevent loss by downy mildew or anthracnose.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLE-LANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop. Woolly aphis should also be systematically fought wherever present, as once the trees are in leaf it is much more difficult to treat.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

Grape vines should be swabbed with the sulphuric acid solution, mentioned in the Notes for August, when the buds begin to swell and just before they burst, as a protection against black spot and downy mildew.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit-fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5·6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5·9	6·19	5·25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6·37	5·0	6·37	5·10	6·17	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·29
26	6·28	5·2	6·39	5·2	6·34	5·15	6·9	5·30
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·39	5·2	6·33	5·16	6·7	5·31
29	6·29	5·1	6·39	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6·39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H. M.
8 May.	●	New Moon	7 2 a.m.
15 ,,	☾	First Quarter	1 25 a.m.
22 ,,	○	Full Moon	6 15 a.m.
30 ,,	☽	Last Quarter	7 45 a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4 14 p.m.
13 ,,	☾	First Quarter	7 0 a.m.
20 ,,	○	Full Moon	7 41 p.m.
28 ,,	☽	Last Quarter	11 17 p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11 36 p.m.
12 ,,	☾	First Quarter	2 16 p.m.
20 ,,	○	Full Moon	10 8 a.m.
28 ,,	☽	Last Quarter	12 20 p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6 17 a.m.
11 ,,	☾	First Quarter	12 14 a.m.
19 ,,	○	Full Moon	1 28 a.m.
26 ,,	☽	Last Quarter	10 51 p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Agriculture.

DESTRUCTION OF NUT GRASS.

BY MAJOR A. J. BOYD.

How to get rid of this widely spread pest on cultivated lands has for many years past baffled practical agriculturists, whether farmers on a large scale well equipped with a variety of weed-destroying implements, or small farmers and market gardeners, who, although working small areas of land, are yet puzzled as to how to conquer the ubiquitous weed. Even scientific men who have experimented for many years in the endeavour to find a remedy have failed to do so. How to do so has been the theme of hundreds of articles in as many newspapers, but all in vain.

In May, 1903, it was brought under the notice of the Department of Agriculture of Queensland that in the Singleton district of New South Wales this noxious sedge, erroneously called grass, was dying, owing to the attacks of an insect parasite, and subsequently the same insect was referred to in the local Press, and was denominated by its entomologist as a "coccid" of the "free moving class." At the same time it was stated that nut-grass plants on which the insect occurred were being disseminated amongst cultivators of the soil in order to secure its establishment, and consequent co-operation in exterminating the weed named in localities remote from that in which the so-called "coccid" had been discovered.

Not long afterwards parcels of such plants were placed under offer, with certain conditions, in different agricultural districts of Queensland, and I believe these were despatched to those who were desirous of experimenting on the pest. The Queensland Government Entomologist, Mr. H. Tryon, with commendable foresight, had, however, anticipated the arrival of such consignments, and had taken steps, in accordance with "*The Diseases in Plants Act of* 1896," to intercept them, it being, in his opinion, essential to ascertain, before admission, not only the generic and specific identity of the insect, but also the degree of probability of its attacking other plants than the one for whose destruction it was being introduced.

On comparison with the account of a European insect—*Antonina purpurea*—he found that the new insect presented the structural features assigned to it.

Meanwhile, it was certified officially by the New South Wales Department of Agriculture that this insect, as far as was then known, had been found to be exclusively associated with nut grass.

This was a question of great importance, especially as all the known *Antonina* species were injurious to members of the grass family.

It has since been shown that the insect attacks grasses—both native and introduced (H. Tryon)—and that its check to nut grass is slight, confined to land undisturbed and chiefly exercised in dry seasons (W. W. Froggatt). At a previous Queensland Agricultural and Pastoral Conference, in 1890, the question of nut grass destruction was debated, and several well-known farmers, sugar-planters, and others suggested various modes of keeping down nut grass, some recommending its being kept down by close-feeding down with stock, or by allowing pigs to root over the infested land. Mr. W. Gibson, of Bingera (Bundaberg district), stated that he had thoroughly cleaned a patch of the weed by covering it with molasses. But he had also had excellent results by the constant use of the Planet Junior, and he considered that, with the help of this valuable implement, no harm whatever would be done by the nut grass to any crop.

An exhaustive paper on this subject will be found in a very early number of the "Queensland Agricultural Journal" (November, 1899), written by the late Mr. Philip MacMahon, Curator of the Brisbane Botanic Gardens in that year, which would be well worth reproducing.

His conclusion was that nut grass cannot be eradicated, but it can be so dealt with as to be rendered perfectly harmless. The velvet bean was tried, and it was found that the nut grass did not thrive under its dense shade. The experiment showed that a good mode of getting rid of the pest is to smother it with a dense mass of this bean, seeding down the infested land heavily. [The present condition of the Botanic Gardens lawns would appear to indicate that its eradication is practicable.—ED.]

Since those early days, many experiments have been made, but not in Queensland. The following comes from the land of agricultural experiments, the United States of America, and I have forwarded a letter I received last month from the Director of Weed Investigation, Bureau of Plant Industry, Washington, United States of America, to the Editor of this journal, suggesting at the same time that its publication will induce some of our Queensland farmers, who would like to see the last of their nut grass destroyed, to try the velvet bean. I may incidentally state this bean is a prolific leaf-producer, giving a very dense shade, and is also exceedingly hardy.

The following is the report referred to:—

"Nut grass is perhaps the most troublesome weed in the southern coastal States, from Maryland to Texas. The species is also regarded as a pest in Arkansas and California. The plant is frequently confused with chufa, from which it can be distinguished by the bitter-flavoured nuts arranged on slender underground stems like widely-separated beads on a string, as contrasted with the sweet-flavoured nuts of chufa, which occur singly. Nut grass is popularly supposed to reproduce by means of seed as well as by nuts, but extensive investigation has failed to reveal either seedlings or viable seeds.

"One of the most important phases in connection with the control of nut grass is the eradication of small patches scattered in the field. Experimental evidence has demonstrated that the most practical and economical method of eradicating small patches is the application of dry agricultural salt (the cheapest grade obtainable), at the rate of from ½ lb. to 1 lb. per square foot.

"It is practically impossible to eradicate nut grass entirely over extended areas of infestation. Nut grass land can be handled in such a manner, however, that the presence of the weed will not prove a serious detriment after the first year of effort. An excellent system of handling nut grass land follows:—

(1) Plant the infested land in corn (or cotton), preferably in check rows. Prepare the seed bed with more than ordinary care. Following each cultivation, the nut grass growing in the rows should be chopped out with a hoe in order that no green growth be allowed to persist. It is desirable to sow soy beans in the corn rows where practicable.

(2) Cultivate at least once a week, using the knife or sweep type implement. Care should be exercised not to scatter the strings of nuts to uninfested land, as is so frequently done by spiked-toothed and spring-toothed harrows, and by the shovel-type cultivator.

(3) As soon as the crop is removed, plough and harrow the land and seed with a winter cover crop, preferably oats and hairy (winter) vetch, a combination cover crop that is particularly successful in subduing nut grass.

(4) The following spring, after the oats and vetch have been harvested for hay, repeat the entire process.

"The nut grass on land handled under this system will be thinned out to such an extent that the weed will cease to be very troublesome. The few surviving nut grass plants should be cut out with a hoe. The rotation has the virtue of continuous use of the land, while the nut grass is being brought under control.

"There is no easy method of controlling nut grass, but there are many helpful points that have been developed from practical experience and experiments. The following suggestions will all be found helpful in dealing with nut grass land:—

"1. *Smother Crops.*—Nut grass will not grow in dense shade, hence any crop which will produce a thick luxuriant growth, such as velvet beans, cow peas, and soy beans sown broadcast is helpful in controlling the weed. The best results have been obtained experimentally with velvet beans. A plot of land heavily infested with nut grass was sown to velvet beans for three successive seasons, and hardly a sprig of the weed grew in the dense shade of the beans. Smother crops are useful on rich lands only, and are not successful against nut grass unless a thick, heavy stand can be grown. Other smother crops available are sweet sorghum and corn in close drills.

"2. *Grazing.*—Geese turned into cotton fields infested with nut grass will keep the tops of the grass closely clipped, and will thus hold the weed in subjection. It is advisable to give the birds other range occasionally in addition to the cotton fields. One farmer estimated that ten geese were equal to one hoe hand in his cotton. Small areas of heavily infested land may be ploughed and hogs allowed to graze the nuts, which they relish. Unless the nuts are abundant, the hogs will starve if given no other feed.

"3. *Freezing.*—The nuts are unable to withstand freezing, consequently it is good practice, particularly in the northern part of the nut grass range, to plough in the fall and leave the land rough over winter in order to expose as many of the nuts as possible to frost. A single freeze has been known totally to eradicate nut grass in ploughed land.

"The use of chemical plant poisons, applied in the form of sprays or otherwise, has been found to be impracticable in dealing with nut grass."

KAPOK.

As several inquiries have been received recently about the cultivation of Kapok, the following information has been compiled by the Government Botanist (Mr. C. T. White) for the guidance of those contemplating the cultivation of this product.

Source.—The principal tree yielding the Kapok of commerce is *Eriodendron anfractuosum* (synonyms—*Ceiba pentandra* and *Bombax pentandrum*), a tree very widely spread over the tropics of both the new and the old worlds. The principal supplies of Kapok come from Java, where the Eriodendron or Ceiba tree has for some years been under plantation cultivation. Ceylon, India, and Tropical Africa supply smaller quantities.

Other and inferior kapoks are yielded by many plants, some of which are natives of North Queensland, as for instance the Indian Simal or Silk-cotton Tree (*Bombax malabaricum*), species of *Cochlospernum*, &c. None of these, however, command prices equal to that of the true Kapok (*Eriodendron anfractuosum*).

Description.—A tall tree with a straight trunk, prickly when young, with whorls of horizontal branches. Leaves palmately divided into 7-9 leaflets. Leaflets 2½ to 6 inches long, edges entire. Flowers whitish or in some varieties rose-coloured. Seed pod oblong, about 6 inches long; seeds numerous in a pod, covered with a fine silky floss.

Cultivation.—The tree can be grown practically along the whole of the Queensland coastal belt from Brisbane northwards. It naturally does best in the tropics.

It is a high tree, attaining a height of over 100 feet and a barrel diameter of over 3 feet.

It can be propagated by cuttings or seed. Cuttings are generally preferred, as the young trees from them are usually spineless and also yield quicker returns.

A suitable distance to plant the trees would probably be about 20 to 25 feet apart. Though probably in Australia, if grown at all, the most profitable way to grow them would be as a side issue, as windbreaks or shade trees, rather than in the form of pure plantations.

From an illustration by Greshoff.]

PLATE 17.—KAPOK TREE, FLOWERING BRANCHLET, AND A RIPE SEED POD.

The following notes are taken from a translation in the Kew Bulletin of an article by Dr. E. Ulbrich in "Notizblatt des Botanischen Gartens, Berlin," 1913, pp. 1 to 34, on Kapok Cultivation in Tropical Africa:—

> Wild Kapok is of little importance for the world's supply on account of the relatively small and uncertain amount of the yield, and the soiling of the wool, which is due to the capsules having to be picked from the ground after they have ripened and fallen, on account of the great height and spiny nature of the trees.
>
> In the plantations the young Kapok trees are usually raised from cuttings. Branches as thick as a man's arm are cut off and planted 3 to 4½ feet deep in the ground, and stripped of their leaves. They grow quickly and usually give rise to spineless trees, which come into bearing rather earlier than seedlings. When the trees grow too high they are lopped in order to facilitate the collection of the fruits and to give more light to the trees planted in between.
>
> Seedlings are transplanted from the seedbeds after six to twelve months or, preferably, after eighteen to twenty-four months. The young plants grow rapidly if they are stripped of leaves and lopped at about 1½ to 2 feet above the ground. Growth is then very quick, and the trees commence to yield when they are four to six years old. Reproduction by seedlings is apt to be unsatisfactory, as the results are much less certain than by cuttings, and spiny forms are apt to occur. The best work on Kapok cultivation is G. F. J. Bley's "De Kapokcultuur op Java."

Diseases and Pests.—The trees do not seem to be bothered much by insect or fungus pests. On this subject Dr. Ulbrich goes on to say—

> The Kapok plantations do not appear to be affected to any considerable extent by parasitic fungi.
>
> They suffer, however, from the attacks of several insects, of which the most harmful are the red bugs, *Dysdercus* spp., which live in the fruits and destroy the wool. Among other insects which injure the fruits are species of *Earias* and *Helopeltis.* Quantities of the young fruits are destroyed by flying foxes. The beetle *Batocera hector* bores into the trunks and sometimes kills young trees. When a tree attacked by it is found, the holes should be filled with benzine and stopped with clay.
>
> Great damage is done to the Kapok plantations in Java by various kinds of mistletoe (*Loranthaceæ*), but nothing is yet known as to the extent to which the Kapok trees are affected by these parasites in Africa.

Uses.—Kapok is used for stuffing cushions, mattresses, &c. It is also used in the manufacture of lifebelts, for which purpose its great buoyancy renders it eminently suitable.

The seeds yield an oil and the residue can be used for manure or in the manufacture of oil cakes for stock foods.

Of other and minor uses an article in the Kew Bulletin for November, 1896, states:—

> "In India the tree yields an almost opaque gum of a dark-red colour, which is said to be astringent, and to be employed medicinally in bowel complaints. The wood is soft and used in tanning leather. An inferior reddish fibre is sometimes prepared from the bark, which is used locally for making ropes and paper. It possesses, however, no commercial value; and the barking of the tree would not compensate for the injury done to it as a source of floss. The young roots are also used medicinally in Bombay. They are dried in the shade, powdered, and mixed with the juice of the fresh bark and sugar. In Java the growing silk-cotton trees are commonly used as telegraph posts, as the branches grow so conveniently at right angles to the trunk that they do not interfere with the wires."

Preparation for Market.—The seed is cleaned by machinery and the floss pressed into bales.

The seeds freed of floss should have a similar value to those of cotton for the expression of oil and the manufacture of the residue into stock food and manurial cake.

THE NATIONAL EXHIBITION, 1921.

The Brisbane Exhibition is rightly regarded as a microcosm of the State, a representation in miniature of the rural industry of a realm, and the 1921 Show will go down in the records as one of the most successful from every point of view yet held. To those who have had an opportunity of judging, the principal show of Queensland compares rather favourably with the Royal Show, the Highland Show, and other annual stock and agricultural exhibitions in the United Kingdom. The outstanding features of this year's show were the district and one-farm exhibits, dairy and beef cattle, the forestry section, the fruit exhibits, and the display made by the Department of Agriculture and Stock. The Returned Soldiers and Sailors Producers' Association, of Woombye, were exhibitors for the first time, and their display was one of the attractions of the show. A dehydrator at work was a very popular feature, and in its neighbourhood the products of the Queensland State Cannery attracted wide attention.

DEPARTMENT OF AGRICULTURE AND STOCK.

The court of the Department of Agriculture and Stock represented an effective and practical illustration of the activities and work of its officers and staff.

The exhibit generally was indicative of the prominent part which agriculture in its true sense plays in the development of a country; and the outstanding feature in the display was the attention paid throughout every section to what may be termed its educational side.

The chief exhibits in the court were illustrative of the State's principal primary industries, and of the technical work of the officers of the Department.

Chief among the exhibits were:—

A comprehensive collection of varieties of sugar-cane from the Bureau of Sugar Experiment Stations.

A display of Merino and Corriedale wools.

An exhibit from the Stock Experiment Station, Yeerongpilly, with special reference to the tick problem, and to the work of the Institute in its relation to the stockowner and dairyman, and the part played in the preparation of vaccines and other specifics, to combat stock diseases; also of the preparation of cultures of various kinds for use in the manufacture of butter and cheese.

A collection of indigenous grasses and weeds; and of plants reputed as poisonous to stock.

A display of maize, to illustrate the improvement being effected by the seed selection work carried on by the Department.

An exhibit of wheats now in cultivation, both in the sheaf and grain form, and similarly of new varieties raised principally at the Wheat Breeding Farm at Roma; also samples of grain about to be sent to London for exhibition purposes. Milling and analytical tests of the Roma State Farm wheats were included in the exhibit, together with descriptive cards.

Samples of different varieties of barley, and oats, and a large assortment of farm and garden seeds.

An educational display of named varieties of sweet potatoes, with comparative details of data respecting the characteristics of each variety.

Two exhibits of cotton, one of which was arranged as a trophy to represent a waterfall, the second trophy being devoted to a display of representative samples from the principal cotton-growing centres in the State. Oil and cotton seed by-products were also included.

Collections of grain or dry district sorghums introduced from the Sudan (Lower Egypt), and from the Bureau of Plant Industry, U.S.A.

Special exhibits of Sudan grass plant specimens to illustrate the work of seed selection designed and being carried out by the Roma State Farm to improve the fodder and hay qualities of this valuable grass.

A collection of cowpeas in plant and seed form to show the improvement work being carried out with this plant also at the Roma State Farm.

A pure seeds display, specially arranged to educate farmers to the advantages to be gained by sowing seeds of high-producing capacity, of good germinable quality, and cleansed of all impurities.

A comprehensive display made by the Entomologist and Vegetable Pathologist, included in which was some interesting work dealing with the banana borer beetle.

An industrial exhibit from the Agricultural College, Gatton, showing the work performed by students, coupled with the display of dairy and farm products and of fodders and concentrates used in stock feeding, with special reference to the use of crushed cotton seed.

The court, as a whole, with its festoons of asparagus fern alternating with bird's nest, staghorn, and other ferns, was set off by an effective colour scheme in ivory and white, and shades of purple relieved with maroon and gold, giving to the *tout ensemble* a strikingly artistic effect.

An innovation this year in the court was an Inquiry Office. Here visitors were able to familiarise themselves with what the Department is doing, and to arrange to be kept in touch later with the work through the medium of the "Queensland Agricultural Journal."

SUGAR EXPERIMENT STATIONS' EXHIBIT.

The Bundaberg and Mackay Sugar Experiment Stations exhibited a number of new varieties, many of them being seedling canes raised in Queensland, Hawaii, Mauritius, India, and Java. There were also some canes from the adjacent island of New Guinea. Full descriptions of these appeared upon the cards attached to the canes, which also gave their commercial cane sugar content. Many of these canes are at present undergoing chemical and field tests, while others have passed the probationary period and are being distributed to canegrowers. Of these, the most successful so far have been Queensland 813, 970, 1098, Java E.K.1, E.K.28, India Shahjahanpur No. 1, Hawaii 146, and 227. These, however, only comprise a small part of the canes which have been distributed from the sugar experiment stations in the course of the past twenty years. Prior distributions included such well-known canes as Badila and the Gorus, which are very largely grown in North Queensland. One of the principal objects of the experiment station is the constant introduction of new varieties and their commercial testing. Before any cane varieties are allowed to leave the experiment stations they have to pass chemical and commercial trials through plant, first ratoon and second ratoon crops. Each variety is tested not less than four times during the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and as to whether their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials on the field, so that it may be determined whether such varieties are good croppers. They are further rigorously watched for evidence of disease, and no affected canes are allowed to go into distribution. When varieties have passed these trials they are carefully examined and packed before being sent to growers living at a distance from the stations. Farmers close at hand are permitted to visit the stations and remove the varieties selected for distribution. All canes are distributed free to canegrowers. The worthless varieties are discarded. Information of this kind could only otherwise be secured by growers and millers at the cost of much time and money, and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

In addition to the work recorded, the experiment station at Innisfail has now commenced work in the direction of raising cane from seed.

Work at the experiment stations also comprises the study of soils, cultivation, and fertilising. It is sought to introduce improved methods of cultivation, liming, fertilising, rotation of crops, conservation of moisture, and growers are taught the principles of cultivation and business methods by visits to the experiment stations, and by lectures and addresses delivered in the various sugar districts, and by the issue of bulletins. It may be claimed that this work has been highly successful, as the following figures, showing the increase in cane and sugar produced per acre and decrease in tons of cane required to make one ton of sugar, will show:—

	1899-1908.	1909-1918.
Average tons cane per acre	14.76	17.37
Average tons sugar per acre	1.60	1.99
Average tons cane to one ton of sugar	9.20	7.76

The sugar experiment stations analyse soils free for canegrowers, and give advice by personal interviews or by letter on the requirements of the soil in the way of

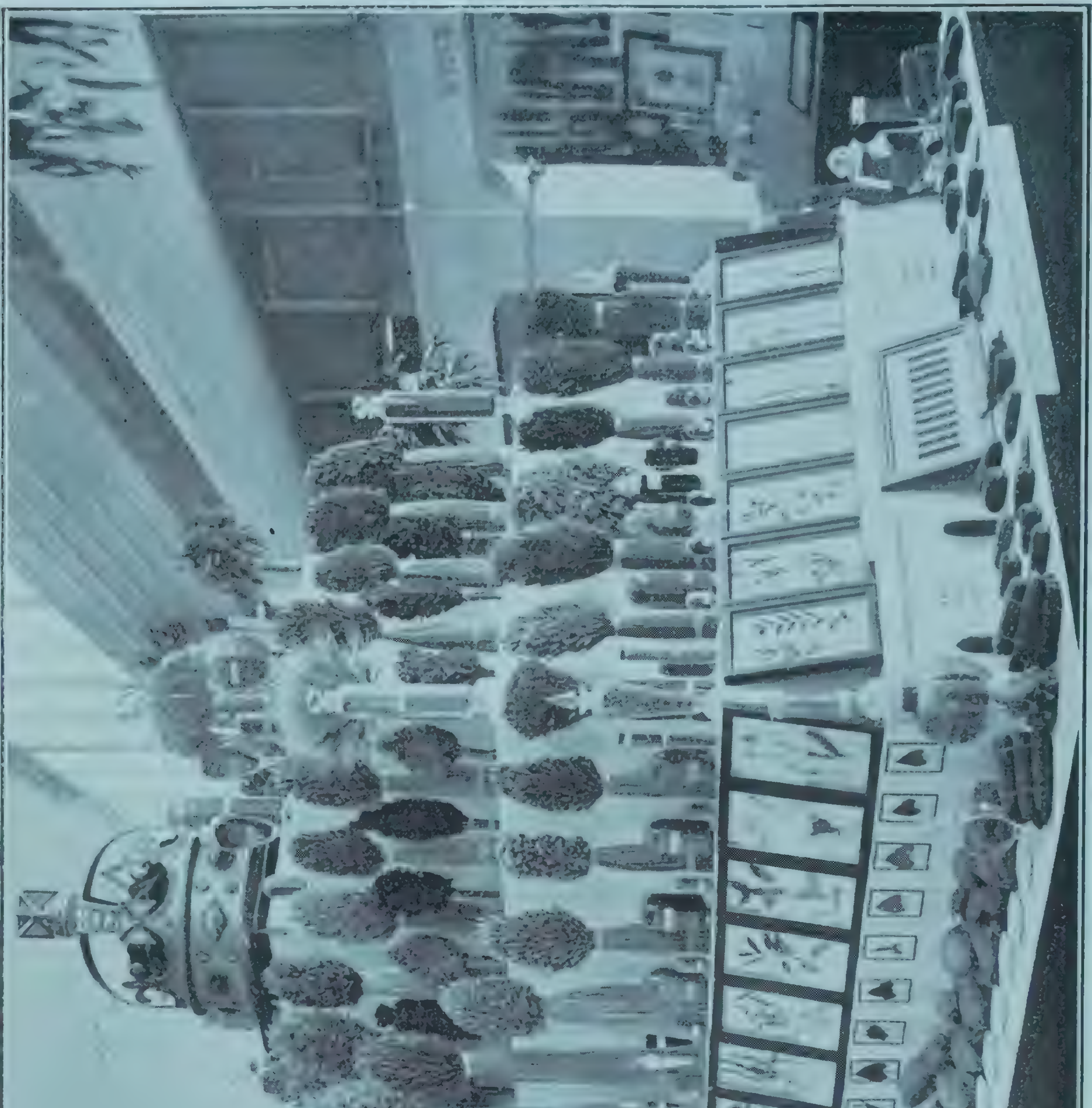

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 18.—CENTRAL TROPHY OF GENERAL AGRICULTURE, DEPARTMENTAL COURT—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

PLATE 19.—GATTON COLLEGE STUDENTS' WORK AND PRODUCTS—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

application of lime where necessary, green manuring and fertilisers, and the treatment of the land by proper soil handling. Cane samples are also tested free of charge, so that growers may know the best time in which to cut their cane. Field officers move around amongst farmers, giving advice on cultural operations.

Investigation and research work in connection with the sugar-cane's most serious pest, viz., the grub. is now being carried out by the Bureau of Sugar Experiment Stations in a systematic manner, and numerous bulletins have been issued upon the subject. The entomological laboratories are situated at Meringa, near Cairns, which is the centre of the worst grub-infested region in North Queensland. Work being undertaken includes:—

Morphological study of reproductive organs of beetles, with relation to the period of ovipositing and the number of eggs produced.

Morphological study of the fungus parasites.

Breeding of the various local parasitic and predaceous insects in cages.

Introduction and breeding of beetle parasites from other countries.

Experimental methods for the rapid multiplication and wide distribution of our fungus parasites.

Introduction of bacterial and fungus enemies of the beetles from other countries.

A further study of various light-traps for the beetles.

A further study of repellents.

Field and laboratory experiments in the use of poisons for the grubs.

Field experiments to determine the relation of fertilisers to resistance, using green manure, stable manure, meatworks refuse, nitrate of soda, and other fertilisers.

The work of the sugar experiment stations, therefore, in relation to its promotion of the agricultural welfare of Queensland in connection with the sugar industry cannot be over-estimated. When it is considered that this industry is the greatest agricultural one in Queensland, and will produce a yield of 250,000 tons of sugar this year, estimated to be of the value of over £7,500,000, it can be seen how highly necessary it is that it should be assisted and encouraged in every possible way. Apart from its economic value, however, it has a deep national significance, and has already played a very large part in peopling the North. According to the recent census, the increase in population in the last ten years in the Herbert Electoral Division was 19.4 per cent. or 14,929 persons, a greater increase numerically than in any other part of Queensland.

THE SUGAR BELT.

Apropos of the sugar industry, it is to be noted, on reference to a map of the State, that the land in Queensland used for sugar-growing is included in a long, narrow, coastal belt. Parts of this belt are separated from each other by considerable tracts of non-sugar country. The latter, owing to a deficient rainfall or poorness of soil, are not utilised for cane. This belt is included between latitudes 16 deg. and 28 deg. south, and the bulk of the staple is grown within the tropics. Cane soils vary considerably in character and composition.

District.	Soils.
Cairns.. ..	Partly shaly sterile soils, but in the main, deep alluvial sandy loams, also rich red volcanic soils.
Mackay ..	Shaly in parts, with better alluvial over the lower levels. Mixed volcanic and rich siliceous alluvia.
Bundaberg ..	Rich alluvial delta soils, interspersed with sterile soils and deep rich red volcanic soils.

The bulk of the sugar soils can be stated to be from good to rich alluvial, such as river flats, with deep red volcanic soils of considerable depth. The nature of the country is generally designated "scrub" and "forest." The North Queensland scrubs are really jungles, carrying a thick growth of what is known as scrub timber, such as silky oak, bean, pender, kauri, silkwood, Johnstone River hardwood, interlaced with lawyer vine and other creeping plants, while the stinging tree is also conspicuous. Forest country usually consists of ironbark, bloodwood, Moreton Bay ash, blue gum, poplar gum, and acacia.

The following are average analyses of a number of soils from each of the three sugar districts mentioned:—

District.	Lime.	Potash.	Phosphoric Acid.	Nitrogen.
Cairns	·292	·310	·141	·122
Mackay	·329	·223	·165	·122
Bundaberg	·636	·144	·494	·120

Rainfall.—The Queensland rainfall, fortunately, is highest during the summer period, at which time the cane plant makes its maximum of growth. The following are average rainfalls in the principal sugar-growing districts:—

Cairns	92.65
Johnstone River	160.88
Herbert River	84.91
Mackay	66.67
Bundaberg	44.40

Cane grows best when the relative humidity of the atmosphere is high, and this is the case during the wet season in Northern Queensland.

Queensland's sugar production in 1867 was 338 tons, and in 1917, 307,000 tons.

Australia is the only place in the world where cane sugar is produced by white labour. We are in competition with countries which produce sugar by black labour and under black-labour conditions. In Java, wages are only about one shilling a day, the worker keeping himself. Without protection through the tariff, or regulation of the price by the Government, it would be quite impossible for the Australian industry to survive.

There is stated to be about £15,000,000 invested in the Queensland industry. It is the greatest industry in the State.

No other agricultural industry in Australia employs so much manual labour.

THE STOCK DISEASES EXPERIMENT STATION, YEERONGPILLY.

At the Exhibition the range of exhibits from this station comprised:—

Economic bacteriology and laboratory products, including vaccines for blackleg, contagious mammitis in cows, strangles in horses, and autogenous vaccines for sepsis.

Natural pleuro-pneumonia virus specially prepared, and blood taken with antiseptic precautions for inoculation for tick fever. Tuberculin for diagnosing tuberculosis. Pure cultures of lactic acid bacteria for the ripening of milk and cream in the manufacture of cheese and butter.

Pure cultivation of disease-producing organisms growing in tubes of artificial nutrient media. Tubercle bacilli (human and bovine), malignant œdema bacilli, blackleg bacilli, anthrax bacilli, typhoid bacilli, coli communis, chicken cholera, fowl enteritis, and pus-producing organisms.

Diagrams drawn from the microscope and illustrating the following:—

The life history of the anthrax bacillus to the spore and back to the bacillus.

The various forms of tick fever germs within the red blood corpuscles of infected animals.

Charts and diagrams illustrating the results of tick eradication work in the United States of America.

Diagrams and charts illustrating how milk becomes contaminated on the farm, and the necessity for pasteurising all milk and dairy products before being fed to calves and pigs.

Museum specimens illustrating manifestations of various animal diseases, including tuberculosis, actinomycosis, pleuro-pneumonia, tick fever, blackleg, swine fever, and other disorders.

WOOL SECTION.

The versatility of Queensland as a woolgrowing State was evidenced by the different types and characteristics of the wools on exhibition. These were specially selected to illustrate the differences exercised by "environment," and were also indicative of the fact that wools of the highest standard of quality are produced here. A special exhibit was made of samples of wool from stud flocks, and of

PLATE 20.—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

1. Stock Institute.
2. Corridor, showing Grasses and Sugar-cane.

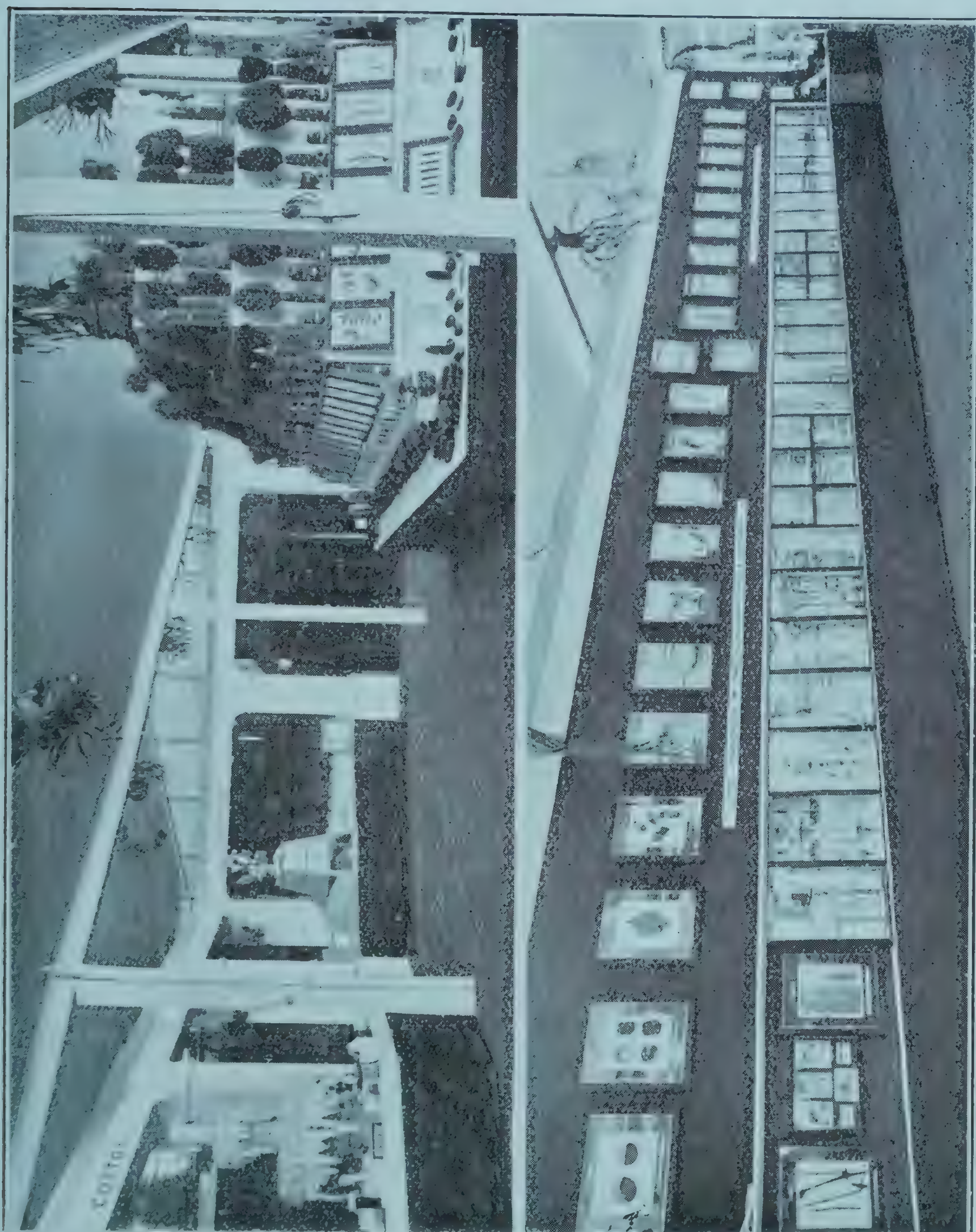

PLATE 21.—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

1. Interior of Court, showing Cotton and General Agriculture.
2. Bureau of Entomology.

PLATE 22.—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

1. Pure Seeds Bureau.
2. Sheep and Wool Bureau.

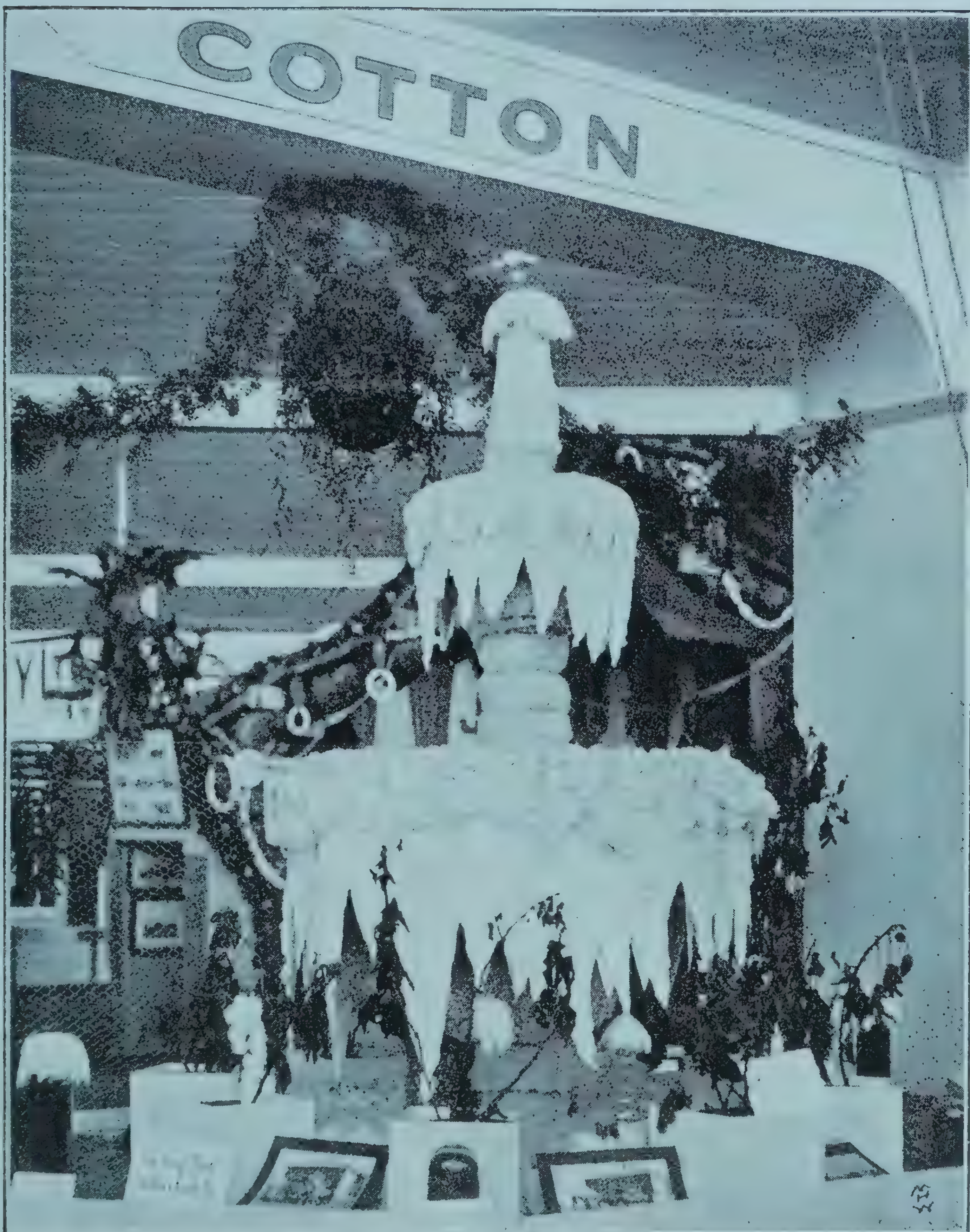

Photo. Dept. of Agriculture and Stock.]

PLATE 23.—EXHIBIT OF COTTON AND BY-PRODUCTS—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

Corriedale wool from sheep in Western Queensland, which proves that this and other British breeds will even thrive side by side with the Merino; and the quality of the wool does not suffer by comparison with that raised even in Victoria and New Zealand. Educational interest was added to the exhibit by the display on cards of practical information and advice on the treatment of sheep fly, the preparation of drenches for stomach worms, and other parasites.

BOTANICAL DIVISION.

The work of the botanical section was represented by collections of grasses, forage plants, and weeds and plants poisonous to stock. In all cases attention was drawn to the fact that this division is always willing to name and report on any specimens of weeds, grasses, trees, and other growths forwarded by farmers or others for identification.

Grasses.—Queensland has always had a reputation for the richness of its pastures, and the comprehensive collection of indigenous grasses and forage plants staged by the Department bore testimony that such has been well earned.

Among the andropogons are the far-famed blue grasses; these are of particular value on account of their palatability and nutritious qualities, some of the larger sorts such as *Andropogon annulatus* and the tassel blue grass being especially noteworthy; as a whole, however, they are not particularly drought-resistant. The genus Astrebla comprises the highly esteemed Mitchell grasses, of which at least four very distinct kinds occur in Queensland. The chief characteristic of these and some other inland species of grasses and herbage are not only their very great nutritive value but the tenacity of life they possess, their drought-resistant qualities, and the rapid way in which they recover and respond to falls of rain, even after long periods of drought, their value in this respect being nothing short of marvellous. It is doubtful if these qualities are to be found to the same extent in the plants of any other country. Among the star grasses are several species esteemed for their fodder value. These belong to the same genus (Chloris) as the imported Rhodes grass. The genus Anthistiria contains several sorts of the kangaroo grasses, and a near ally of them is the Flinders grass, one of the most nutritious of the Western grasses—palatable both green and dry. Quite an array of panic grasses was on exhibit, and grasses of this genus are generally highly esteemed. Beautiful grasses of various species of Eragrostis, or love grasses, though perhaps containing none of great outstanding value, are useful in mixed pastures, like many others of secondary importance. The button grasses and the crowfoot are of cosmopolitan distribution; of the former the annual sort is very highly valued as a sheep fodder. Several native species of paspalum were shown, and among them were some of considerable importance, particularly as fodders in the more tropical parts. The native sorghums are large-growing, rather coarse grasses, but both horses and cattle do well on them and relish the fodder yielded, especially when cut and fed as a forage crop. Coastal grasses were represented by the coast couch, couch spinifex, and others useful as sand-binders on the sand dunes, and as mud-binders on salt flats and estuarine areas, as well as for fodder in such places. Of grasses especially adapted for wet or swampy situations, especial attention was drawn to the water couch, rice grass, *Panicum proliferum*, *Panicum obseptum* (an especially good water grass), and two sorts of Chamæraphic swamp couches.

In addition to fodders, several of the larger grasses yield material suitable for paper pulp, and in this connection the blady grass or lalang, and the common reed (Phragmites) have received some attention, and may yet have a considerable value in this respect in the near future.

Edible Trees and Shrubs.—Among the more remarkable and valuable economic features of the Australian vegetation is the number of shrubs and trees of dried inland "scrubs" and open country that are edible for stock. The collection shown proved interesting to stockowners, pastoralists, and agriculturists generally. Among the many sorts that may be especially noted are the mulga, kurrajong, apple-tree, wild orange, native pomegranate or bumble tree, emu bush, whitewood, weeping myall, cattle bush, cotton bush, and various species of saltbushes. All these and others have helped to keep stock not only alive but in good condition during long spells of dry weather. The conservation, propagation, and further utilisation of these valuable plants is a matter of national importance. They are particularly valuable in prickly-pear areas, and the fine condition of cattle that sometimes come off pear country in drought periods is due almost entirely to them, these edible trees and shrubs yielding nutritive elements not found in the pear.

Weeds.—On the central trophy was displayed a collection of weeds, special attention being directed to those harmful to stock in any way, such as the thorn apples (*Datura* spp.), pimpernel, heart-leaf poison bush, and peach-leaf poison bush.

MAIZE.

The section devoted to this cereal called attention to what may rightfully be termed "The King of Grains." The average aggregate yield of maize in the State, taken over a period of years, exceeds 3,000,000 bushels annually, the produce of approximately 149,000 acres, and at times upwards of 4,000,000 bushels are harvested. The average yield per acre still leaves much to be desired and there is room for improvement both in quantity and quality of grain, and effort is being directed by the Department to the standardising of types and to the improvement of individual crop yields. Consequently the selection of seed maize of this character, calculated to suit Queensland conditions, ranks among the foremost of the Agricultural Department's activities.

For several years past the Department, by adopting a policy of seed propagation plots, has been able to offer to growers at reasonable rates graded seed of improved varieties and types of maize. That this action is appreciated is shown by the increased demand for such seed, with a consequent improvement in yields and quality of grain throughout many of the maizegrowing portions of the State and instances are on record where yields have exceeded 100 bushels per acre under field conditions. Standard varieties of maize were exhibited in this section, and proved their high educational value.

Specimen ears showing good, bad, and indifferent types were prominently displayed, and were explained by means of clearly printed labels in large type, drawing attention to the qualities to be valued, or avoided, in each individual ear, so that this section of the Departmental exhibit might be of the highest educational interest and value to growers.

SORGHUMS.

No more popular crop is grown for stock-feeding purposes than sorghum, of which many varieties exist. The most wonderful drought-resisting qualities of this class of fodder, together with its nutritive value, commends it to the dairy farmer, particularly in dry districts, as a standby in preference to maize, when pastures are failing. For the purpose of ensilage-making and providing a bulk ration for dairy stock, it has few equals. Certain varieties have strong frost-resistant qualities, and may be sown in late summer to provide a standover crop of bulky succulent fodder in the early winter months, especially in those districts where only light frosts are experienced.

Grain Sorghums.—Whilst not so universally grown, these are fast coming into more general use for purposes of food for horses, cattle, pigs, and poultry. Their ability to produce grain under conditions which would be fatal to maize justifies their cultivation by all owners of stock.

Instances have been reported from the Darling Downs where the cultivation of feterita has supplanted that of maize for purposes of horse feed, with results entirely in favour of this variety of grain sorghum.

Poultry-farmers invariably report favourably on this class of grain, and in one instance, on a large poultry farm, unqualified success was attained by feeding the birds entirely with this grain.

Millions of bushels of grain sorghums are raised annually in the United States of America by farmers who recognise the economic value of this crop.

With a view to improvement in the varieties of grain sorghums already introduced into Queensland, several varieties have been imported from the Sudan and United States of America. These sorghums have already been tried in various districts, and although the recently introduced varieties are not yet acclimatised, many have given satisfactory results. Specimen bottles of seeds, showing a range in size and colouring, were on exhibition; also numerous samples of seedheads to illustrate the prolific nature of the crop.

Analytical charts indicating the food values of the several varieties occupied a prominent position, and go to prove that the analytical chemist plays an important part in determining the relative value of these grains for stock-feeding purposes.

WHEATS.

This section was of unusual interest to the wheatgrowers of the State, as the 1920 crop marked a most important period in the history of the production of this cereal in Queensland, as it proved to be the largest ever harvested—something over 4,000,000 bushels. This was the first occasion also on which it was found necessary to formulate a wheat pool for the purposes of handling and marketing the crop on co-operative lines.

The display of new crossbred wheats, in conjunction with the results of milling and analytical trials, was representative of the work of breeding and selecting types of wheat suitable for this State. This work is now being carried out at the Roma State Farm, where, for the season 1920, some record yields of wheat were obtained with many of the varieties now under observation. In order that none but suitable wheats (both from the growers' and millers' standpoint) may be introduced into

Photo. Dept. of Agriculture and Stock.]

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 25.—A DISPLAY OF QUEENSLAND FRUITS BY THE QUEENSLAND FRUITGROWERS' ASSOCIATION—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

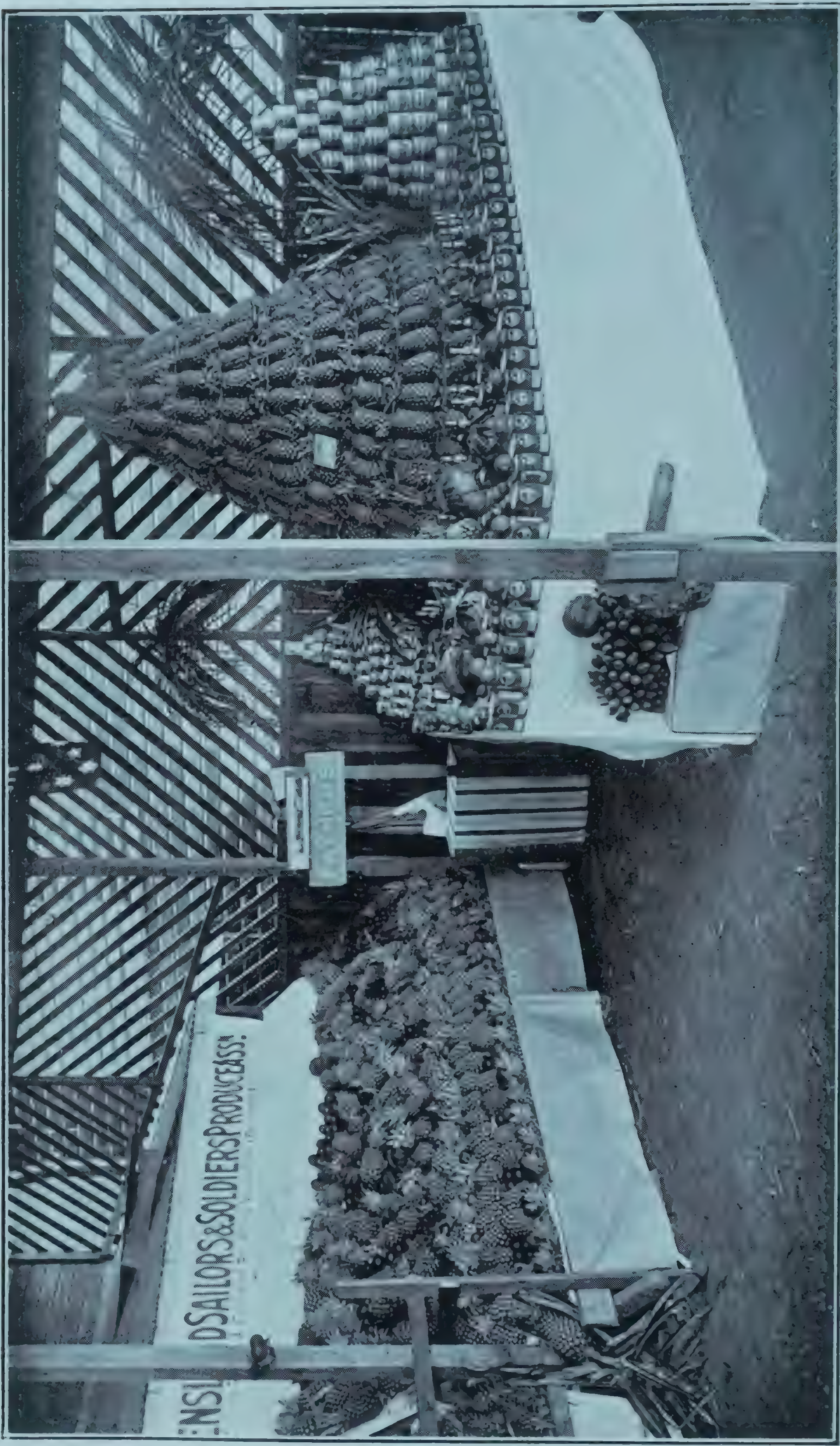

Photo. by Department of Agriculture and Stock, Brisbane.]

PLATE 26.—DISPLAY OF FRUIT PRODUCTS BY THE SAILORS AND SOLDIERS PRODUCE ASSOCIATION, WOOMBYE NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

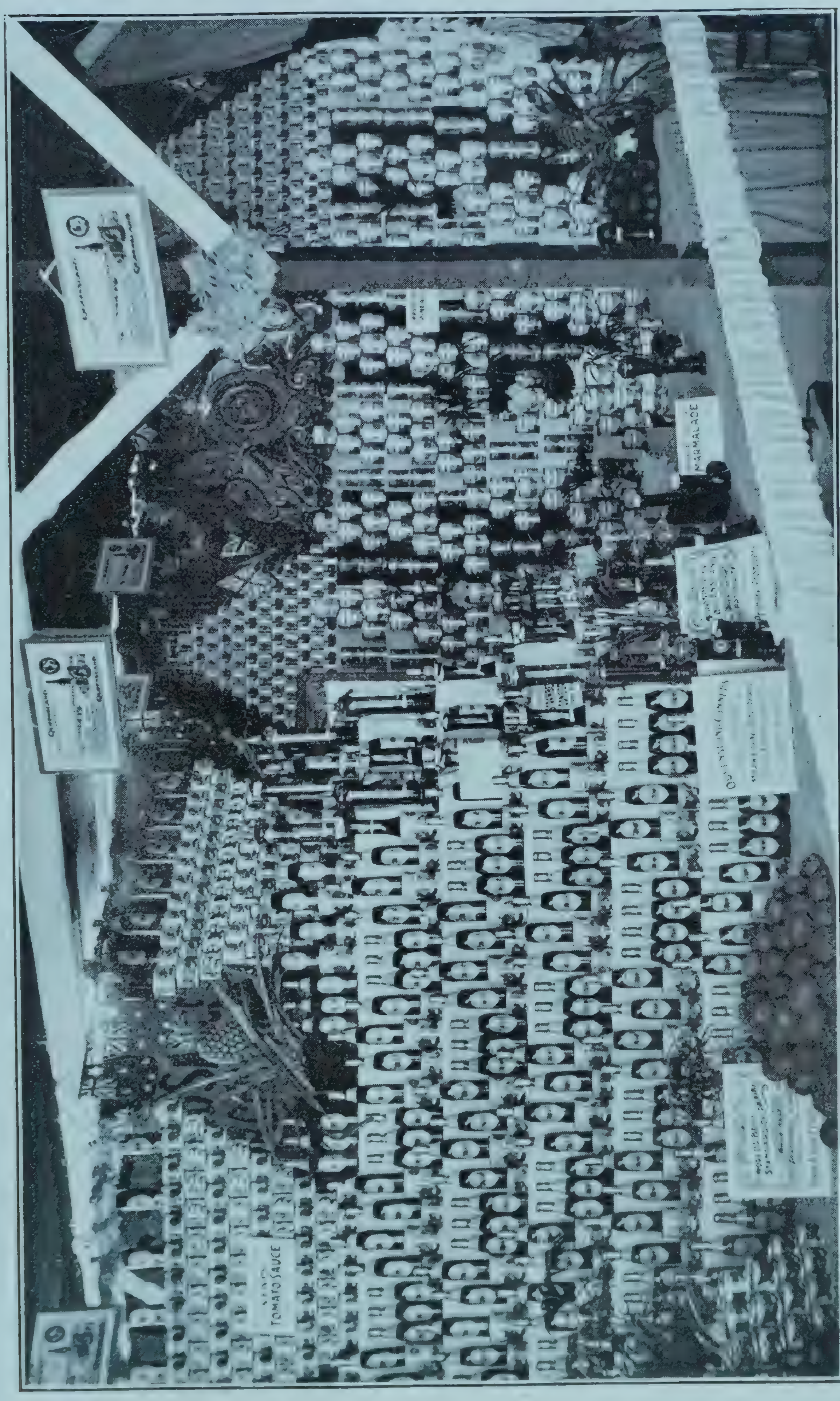

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 27.—EXHIBIT OF PRODUCTS BY THE STATE CANNERY—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

general cultivation by the Department of Agriculture, careful analytical and milling tests are conducted in the laboratory for the purpose of ascertaining the nutritive food values of individual wheats. Comparative field tests are also being carried out to ascertain their suitability under normal and adverse conditions of growth. Thus it is possible to ascertain to the fullest extent the general characteristics and value of a variety before its liberation for general use.

Few growers of this necessary cereal probably recognise the care and patience demanded of the wheatbreeder in his endeavour to introduce an improved variety of wheat. The delicate operation and necessary skill which attend cross-fertilisation, the successful raising of the plant from seed obtained by the crossing of two varieties, the selection of a type from the resulting plants and its ultimate observation and fixation, culminate in subsequent trials over larger plots under varying field conditions, until by repeated tests certain new and improved types are produced, which in turn are submitted to the chemist for the final determination of their milling and nutritive qualities. Having passed this routine satisfactorily, the new variety is tested in different districts and under varying soil conditions before it is considered worthy or otherwise to be brought into general cultivation. Of the many hundreds of varieties produced, few reach the stage of being classed amongst the useful wheats of the world. In wheatbreeding, it is decidedly the "survival of the fittest."

MISCELLANEOUS FARM AND GARDEN SEEDS.

Due prominence cannot always be given in a combined display, such as that staged, to individual exhibits that in many instances represent important industries, such as the growing of malting and Californian brewing types of barley, which is carried on in a fairly large way on the Darling Downs, and the growing of canary seed, a crop which of late years has come into much favour with farmers, also on the same tract of country.

Another bird seed crop of recent introduction, as far as the commercial utilisation of the seed is concerned, is French millet, a summer-growing variety, all the more valuable on this account in case of a failure of or of the necessity for supplementing the canary seed crop. One feature which claims attention on the part of these two crops and of others of kindred character—like liberty, Japanese, and Manchurian millets—is their excellence as green crops and for making into hay.

The value of different forms of artificial fodder, and the wisdom of cultivating a variety of crops which may be used for this purpose, is freely acknowledged by the dairyman and pigbreeder who has the prosperity of his business at heart.

Numerous specimen sheaves of plants and of seeds which have proved valuable, either alone or in combination with other crops, for stock purposes were displayed. Nature in Queensland is at times "wondrous kind" in the matter of providing its abundance of natural pastures and herbage; but the stockowner as a class is rather prone to disregard the lessons of the drought, and of the fact that a multiplicity of crops can be readily grown in normal seasons. Perhaps no better inspiration can be found as an incentive to progress and to a safer competence than the word "provide," which should be indelibly stamped on every barn door and silo throughout the State.

Some well-grown samples of flax (linseed) were exhibited as an illustration of the fact that the crop can be produced in moist seasons. Although Victoria is the only State possessing a flax mill, there is a movement on foot here to test the growth of linseed as a commercial proposition, notably near Toowoomba, so that, should results warrant the establishment of such a mill, there will be a means at hand to effectively cope with the crop on a co-operative treatment basis.

Cotton.—Public attention has lately been focussed on this crop, as being peculiarly suited to conditions in Queensland, and from the specimens, both of seed cotton and lint, exhibited, it was seen that this State is fully capable of producing cotton of the best quality. With a view of extending its cultivation, the Government is advancing 5½d. per lb. to all growers of seed cotton, for a further period of two years, actually up to 30th June, 1923. Last season's crop was the heaviest recorded in Queensland for a considerable period, and to the present date the Department of Agriculture and Stock has received on behalf of the growers, for ginning purposes, approximately 710,000 lb. of seed cotton. Late last month 664 bales of cotton, weighing approximately 50 tons, were shipped to Liverpool by the s.s. "Westmoreland," and additional shipments are expected to be made in the near future.

In the course of the past season the Department initiated a scheme of seed selection with a view to the propagation of improved strains, and in connection with this work plots have been established in several districts.

Sweet Potatoes.—Special mention is demanded by this section, dealing as it does with a crop largely grown throughout Queensland, and which plays a useful part on the farm for stock-feeding purposes.

The sweet potato ranks high as a starch producer, and as a source of supply of power alcohol.

For some time the Department of Agriculture has been engaged in placing the classification and testing of sweet potatoes on a more satisfactory basis, and, with this in view, propagation plots were established for raising the several varieties under observation. Considerable progress has been made in this direction and in the compilation of data, and recently analytical tests were conducted to ascertain their respective nutritive qualities, and it has been shown in the comparative trials that some of the larger varieties are capable of affording heavy yields—upwards of 30 tons to the acre.

The exhibit comprised nearly fifty varieties of potatoes, and the characteristics and respective starch production of each was clearly set out in tabulated form on cards in close proximity to the tubers. Specimen leaves also of each kind, specially mounted for the purpose, were also shown.

Sudan Grass.—This popular variety of the sorghum family, of comparatively recent introduction into Queensland from the Bureau of Plant Industry in U.S.A., is commencing to show reversions in type and characteristics amounting to a pronounced loss of productivity of individual plants.

With a view of carrying out certain seed improvement work with special strains of this plant, selections have been made at Roma State Farm, where this fodder has been under close observation since its introduction.

The specimens on exhibition proved the value of careful and systematic seed selection for hay and fodder purposes, and served as an object lesson to growers.

Individual plants were also shown, to illustrate the varieties and reversions to be met with in commercial crops of this "grass."

Cowpeas.—An interesting and educational exhibit was staged in that section devoted to cowpeas, showing the results obtained by cross-breeding experiments at Roma State Farm.

As a summer crop (in localities and on soils unsuited to the growth of lucerne), and one which plays an important part in the restoration of humus to the soil, cowpeas have few, if any, equals. Apart from that, it forms a valuable food, in a "cured" condition, for milch cows and working horses, being extremely rich in protein.

The benefits accruing from the ploughing-in of a crop of cowpeas on heavy soils are fully recognised, particularly on sugar lands, where the crop is highly valued as a soil renovator and for supplying nitrogen and vegetable matter.

Cowpeas are aso particularly valuable in connection with pig-raising, being prized for fattening off animals under the paddock system.

PURE SEEDS SECTION.

The exhibit of 240 varieties of agricultural and vegetable seeds, and a named collection of the 90 weed seeds most frequently found in impure samples, directed attention to the work of the Pure Seeds and Stock Foods Branch of the Department.

The importance of having seeds tested, before sowing, will be realised when it is stated that during the year ended 30th June, 1921, out of every hundred samples of Rhodes grass seed examined, thirty-five had a germination of less than 20 per cent. In every hundred samples of lucerne seed, nine samples contained more than the prescribed amount of weed seeds or inert matter. An idea as to what 1 per cent. by weight of a weed seed means will be more clearly understood when it is realised that 1 per cent. of darnel in 1 lb. of oats means the buyer would sow 390 seeds of this weed. One per cent. of oriental rocket equals no less than 17,900 seeds in 1 lb.

Queensland produces a larger quantity of millets, lucerne, Sudan grass, and other seeds than is usually supposed, and there is much to be said in favour of seed grown within the State. This, however, requires to be cleaned with as much care as that produced elsewhere, and farmers would do well to ascertain the percentage of purity and germination of their own seed, as well as that purchased from a neighbour. Particular attention is directed to the using of ungraded seeds, some of which may contain seeds of a poisonous nature, such as *Datura stramonium.* These find their way into chaff and other stock foods, and may lead to serious loss of stock.

Buyers of both stock foods and seeds should let quality, rather than price, be their guide, and in the case of any doubt as to the goods purchased, write to the Department without delay, so that the matter may be investigated whilst the goods are intact and the facts fresh in the memory of both buyer and seller.

It cannot be too widely known that buyers whose main source of income is derived from agricultural pursuits may send samples of seeds for analysis, no charge being made provided the seeds were purchased as seeds for sowing, and the following particulars given:—

(1) Vendor's name and address;
(2) Name of seed;
(3) Quantity purchased;
(4) Locality where the seed is to be sown; and
(5) Name and address of purchaser.

The weight of samples sent should not be less than 8 oz. of oats, cowpeas, maize, &c., 4 oz. of sorghum, Sudan grass, panicum, millet, lucerne, &c., and 2 oz. of Rhodes and paspalum grasses. If the result of the examination is required for purposes of sale a fee of 2s. 6d. is charged.

ECONOMIC ENTOMOLOGY AND PLANT PATHOLOGY.

The Division of Entomology and Vegetable Pathology, under Mr. Henry Tryon, exhibited objects of unique interest, as illustrative of its educational activities, all of which have been prepared by his assistants, Messrs. Edmund and Hubert Jarvis, and are alike expositions of scientific work and artistic skill.

The display embraced three different groups—

(1) Economic insects, life histories;
(2) Plant diseases, colour portrayals; and
(3) Insectivorous birds—stomach contents;

in each of which, samples from the Departmental collections were on view.

The insectivorous bird section, four large cases, relating to some fifty birds and about thirty different kinds, illustrated the procedure followed and results secured in examining the contents of the birds' stomachs, and indicated the actual food partaken of shortly prior to death, and the extent to which insects enter into its dietary. On any question then that arises as to a bird being actually insectivorous, and as to the insects it consumes, it yields evidence that cannot be gainsaid.

The group illustrating disease occurrence comprised a selection of coloured nature prints based on photographs (taken by the photographic artist—Mr. Mobsby—and his assistant), and aimed at the portrayal of plant-maladies as the growers see them. The twenty-four pictures on view illustrated maladies of citrus (orange and lemon), coffee, banana, apple, grape, potato, cabbage, lucerne, and maize. Another method used in making manifest the appearance, action, and effect of plant-disease was shown in a special case devoted to the Irish blight of the potato.

The economic entomology (life histories) group, was of striking interest, and was quite unique in its way. It comprised thirty cases, illustrating the life-phases of upwards of seventy different insects, the injuries that the several plants they attack evince, and in many cases their parasites and other natural enemies. These illustrations comprised actual specimens of the insects themselves, coloured drawings of them, both natural size and enlarged, and specimens illustrating their depredations; and in the case of fruits, models of wax. This series also comprised some stock pests, including beautifully depicted figures of the nine sheep-blowflies, and the so-called poisonous caterpillar of cattle (*Pterygophorus uniformis*). Among plant-destroyers may be mentioned Tryon's fruit fly, with twelve of the cultivated fruits it is wont to destroy; the yellow maize moth and the eleven plants and fruits it injures; thirty-nine insects attacking the orange, including twelve of the scale-insects associated in this work; the ladybird, the flea beetle, the tuber moth, the green caterpillar injuriously related to the potato, the cutworm, the diamond moth, the stem worm (*Hellula undalis*) and the pyralid (*Godaracomalis*) of the cabbage, the blue weevil, and the web-worm of the sweet potato, the bean fly, weevils of pea and bean species, the pumpkin beetle, the army worm (*Leucania unipunta*) of cereals, the grain weevil, the grain moth (*Sitrodrepa cereallela*), and the flour moth (*Ephestia kuehniella*).

Whilst the cotton insects were represented by an illustrative exhibit of the four Queensland sap-sucking species, there was also a case showing species of those remarkable leaf-eating insects, the phasmidæ or spectre insects.

Not the least important feature in the display of the Entomological Branch related to a single injurious insect. This exhibit was by J. L. Froggatt, B.Sc., entomologist in charge of banana beetle borer investigations. It comprised numerous examples of the two sexes of *Cosmopolites sordidus* (the insect in question) and its eggs—both free and *in situ*—a case especially devoted to the weevil's life history; and again, portions of banana corm and stem that served to manifest the extent as well as the nature of this pest's depredations.

QUEENSLAND AGRICULTURAL COLLEGE.

This section was of educational interest, and illustrated certain phases of the instructional work imparted to students. Prominence was given to exhibits of cheese, butter, and dairy produce generally; to examples of carpentry, and of blacksmithing and saddlery, representing industrial sections, a knowledge of which is of much importance to the man who has to wrest a living from the land.

A variety of farm produce, and of wool raised and classed at the College, was also displayed.

A special section of the trophy was devoted to fodder conservation and the uses of different classes of farm-grown fodder in conjunction with concentrates, more particularly with crushed cotton seed, as quantities of cotton seed are now available in Queensland and offers a cheap and nutritive adjunct for stock-feeding purposes.

Photo. by Dept. of Agriculture and Stock.]

PLATE 28.—COMPLETE WORKING SECTION OF A MODERN DEHYDRATOR—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 29.—QUEENSLAND AGRICULTURAL COLLEGE CHAMPION GUERNSEY BULL "SURPRISE OF GRON."

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 30.—QUEENSLAND AGRICULTURAL COLLEGE FORMER CHAMPION FRIESIAN COW "PRIM."

DISTRICT EXHIBITS.

"A" GRADE

The district exhibits were well worthy of the regions represented. The West Moreton display was a most comprehensive one, and covered the whole field of activity in local primary and secondary production—Ipswich, Esk, Toogoolawah, Lowood, Marburg, Boonah, and Rosewood being the chief contributing centres. The Wide Bay and Burnett had a very fine court in which products from every sub-district were well to the fore—Maryborough, Bundaberg, Gayndah, South Burnett, Gympie, Mary Valley, Kin Kin, and Cooran all sending comprehensive exhibits. The Darling Downs entered the lists for the first time since 1918, and made an excellent show of products from every centre from Toowoomba to Texas.

Following are the details of the competition:—

—	Possibie Points.	Wide Bay and Burnett.	Darling Downs.	West Moreton.
(1) DAIRY PRODUCE (210)—				
Butter, 1 box	90	84	78	83
Milk, condensed, concentrated, or dried ..	40	..	28	36
Cheese, 1 cwt.	60	45	45	48
Eggs	20	5	18	15
	210	134	169	182
(2) FOODS (185)—				
Hams and bacon	50	44	45	46
Rolled and smoked beef and mutton ..	20	5	12	17
Smallgoods and sausages, if smoked or preserved	10	4	8	9
Fish—Smoked, preserved, and canned ..	10	3	7	2
Canned meats	25	..	10	20
Lard, tallow, and animal oils	20	5	15	17
All butchers' by-products, not included in any other part of scale of points ..	10	..	8	8
Honey, and its by-products	20	14	18	15
Confectionery	10	6	8	5
Bread, biscuits, scones, and cakes	10	..	7	2
	185	81	138	141
(3) FRUITS, VEGETABLES, AND ROOTS (Fresh and preserved) (195)—				
Fresh fruits—all kinds	60	54	39	50
Preserved fruit, jams, &c.	30	18	27	20
Dried fruits	10	5½	9	4
Fresh Vegetables—all kinds, except potatoes	25	9	22	19
Prepared and dried vegetables, pickles, sauces, &c.	10	5	7	6
Potatoes	40	25	25	30
Roots—all kinds—and their products, arrowroot, cassava meals, &c. ..	14	10	10	8
Cocoanuts, peanuts, and other nuts ..	6	4	3	2
	195	130½	142	139
(4) GRAIN, &c. (150)—				
Wheat, meals prepared therefrom	50	33	43	23
Maize	50	30	40	44
Flour, &c.	10	6	8	..
Oats, rye, rice, and their meals	30	21	25	15
Maizena, &c.	10	4	7	..
	150	94	123	82
(5) MANUFACTURES AND TRADES (155)—				
All woodwork	30	20	23	28
All metal and ironwork	30	26	23	24
Leather and all leather work and tanning ..	20	11	17	15
Manufactured woollen and cotton fibre ..	30	..	10	30
All tinwork	10	8	6	7
Artificial manures	10	9	3	6
Brooms and brushes	10	2	8	2
Manufactures not otherwise enumerated ..	15	7	12½	14
	155	83	102½	126

DISTRICT EXHIBITS—*continued.*

—	Possible Points.	Wide Bay and Burnett.	Darling Downs.	West Moreton.
(6) MINERALS AND BUILDING MATERIALS (100)—				
Gold, silver, and precious stones	25	13	13	8
Coal, iron, other minerals, and salt ..	30	13	15	19
Stone, bricks, cement, marble, terracotta ..	20	12	14	18
Woods—dressed and undressed	25	22	20	25
	100	60	62	70
(7) TROPICAL PRODUCTS (150)—				
Sugar-cane	60	52	2	25
Sugar (raw and refined)	20	18	..	4
Rum, spirits, and by-products	10	3	6	10
Coffee (raw and manufactured), tea, and spices	10	4	3	5
Cotton (raw) and by-products	30	20	10	15
Rubber	10	..	..	..
Oils (vegetable)	10	5	..	5
	150	102	21	64
(8) WINES, &C. (25)—				
Wines	15	3	10	7
Aerated and mineral spa water	10	6	10	7
	25	9	20	14
(9) TOBACCO (20)—				
Tobacco (cigar and pipe) in leaf	20	2	15	6
(10) HAY, CHAFF, &C. (170)—				
Oaten, wheaten, lucerne, and other hay ..	30	15	20	25
Grasses and their seeds	7	3	6	4½
Oaten, wheaten, lucerne, and other chaffs ..	50	25	40	38
Ensilage and other prepared cattle fodder ..	20	10	10	15
Sorghum and millets	10	4	6	6
Commercial fibres (raw and manufactured)	10	7	8	6
Pumpkins and other green fodder	10	6	8	8
Hemp and flax	10	5	8	2
Broom millet	10	5	5	7
Farm seed	13	6	11	7
	170	86½	122	118½
(11) WOOL, &C. (110)—				
Scoured wool	40	35	25	30
Greasy wool	60	50	48	49
Mohair	10	10	7	9
	110	95	80	88
(12) ENLARGED PHOTOGRAPHS	5	1	5	5
(13) EFFECTIVE ARRANGEMENT (80)—				
Comprehensiveness of view	30	10	30	20
Arrangement of sectional stands	15	8	15	12
Effective ticketing	20	2	20	15
General finish	15	8	15	12
	80	28	80	59
Totals	1,555	906	1,079½	1,094½

SUMMARY.

—	Wide Bay and Burnett.	Darling Downs.	West Moreton.
No. 1, Dairy produce (210)	134	169	182
No. 2, Foods (185)	81	138	141
No. 3, Fruits, vegetables, and roots (195)	130½	142	139
No. 4, Grain, &c. (150)	94	123	82
No. 5, Manufactures and trades (155)	83	102½	126
No. 6, Minerals and building materials (100)	60	62	70
No. 7, Tropical products (150)	102	21	64
No. 8, Wines, &c. (25)	9	20	14
No. 9, Tobacco (20)	2	15	6
No. 10, Hay, chaff, &c. (170)	86½	122	118½
No. 11, Wool, &c. (110)	95	80	88
No. 12, Enlarged photographs (5)	1	5	5
No. 13, Effective arrangement (80)	28	80	59
Total (1,555)	906	1,079½	1,094½

"B" GRADE.

The Northern Darling Downs won the "B" Grade competition in the district exhibit with a total of 794 points. Maranoa was second with 774 points, and Kingaroy third with 765 points. This was the first time the winners had competed. The district comprises Dalby, Chinchilla, Bakingboard, and adjacent localities.

The following are the awards:—

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(1) DAIRY PRODUCE (170)—					
Butter	90	83	83	80	79
Cheese	60	51	..	50	46
Eggs	20	15	16	15	10
	170	149	99	145	135
(2) FOODS (120)—					
Hams, bacon, rolled and smoked beef and mutton	50	36	25	30	32
Fish—smoked	10	..	6	1	4
Lard, tallow, and animal oils	15	12	7	10	10
Honey, and its by-products	25	14	15	12	11
Confectionery (home-made)	10	6	4	8	6
Biscuits, bread, cakes, and scones (home-made)	10	9	6	6	6
	120	77	63	67	69
(3) FRUITS, VEGETABLES, AND ROOTS—Fresh and preserved (190)—					
Fresh fruits—all kinds	60	35	50	40	36
Preserved fruits and jams, &c., prepared by farmer	20	14	18	10	13
Dried fruit, prepared by farmer	5	3½	3½	4	4½
Fresh vegetables—All kinds except potatoes	25	17	14	20	18
Preserved and dried vegetables, pickles, sauces, &c.	10	7½	8½	7	7
Potatoes	40	30	27	22	27
Roots—all kinds—and their products, arrowroot, cassava meal, &c.	10	6	3	3	5
Cocoanuts, peanuts, and other nuts	10	6	2	3	3
Vegetable seeds	10	8	7	4	6
	190	127	138	118	119½

"B" GRADE—*continued.*

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(4) GRAIN, &c. (150)—					
Wheat	50	15	15	30	43
Flour	10	5	3	8½	7½
Maize	50	42	35	36	38
Maizena, meals, starch, glucose, &c.	10	4	2	4	..
Oats, barley, malt, and pearl barley, and their meals	30	18	9	18	14
	150	84	64	96½	102½
(5) WOODS (40)—					
Dressed and undressed	25	18	20	23	18
Wattle bark	15	14	13	14	10
	40	32	33	37	28
(6) HIDES (10)—					
Free from offensive smell ..	10	6	6	7½	6½
(7) TROPICAL PRODUCTS (100)—					
Sugar-cane	60	10	45	..	..
Coffee, tea, and spices	10	1	1	..	..
Cotton (raw) and by-products ..	30	8	10	8	15
	100	19	56	8	15
(8) MINERALS (55)—					
Gold, silver, and precious stones ..	25	7	13	..	7
Coal, iron, and other minerals, and salt	30	5	9	11	18
	55	12	22	11	25
(9) TOBACCO (20)—					
Tobacco (cigar and pipe), in leaf ..	20	5	6	8	10
(10) HAY, CHAFF, &c. (170)—					
Lucerne, oaten, wheaten, and other hay	30	18	13	19	21
Grasses and their seeds	7	6	5	7	3½
Oaten, wheaten, lucerne, and other chaffs	50	25	25	28	23
Ensilage and other prepared cattle fodder	20	15	12	9	6
Sorghum and millets	10	8	5	5	6
Commercial fibres	10	7	6	..	8
Pumpkins and other green fodder	10	7	6	8	7
Hemp and flax	10	7	5	4	8
Farm seeds	13	10	6	6	4
Broom millet	10	5	7	8	8
	170	108	90	94	94½
(11) WOOL, &c. (110)—					
Scoured wool	40	35	30	40	35
Greasy wool	60	45	48	55	60
Mohair	10	7	8	9	10
	110	87	86	104	105
(12) ENLARGED PHOTOGRAPHS ..	5	2	1	5	3

"B" GRADE—*continued.*

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(13) Ladies' Work (30)—					
Needlework, knitting, fine art ..	15	10	11	10	14
School work, maps, writing, &c., for pupils of schools in the district	15	11	8	13	10
	30	21	19	23	24
(14) Effective Arrangement (80)—					
Comprehensiveness of view ..	30	15	30	26	8
Arrangement of sectional stands	15	8	15	12	4
Effective ticketing	20	5	15	20	20
General finish	15	8	15	12	5
	80	36	75	70	37
Grand totals	1,250	765	758	794	774

SUMMARY.

	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
1. Dairy produce	170	149	99	146	135
2. Foods	120	77	63	67	69
3. Fruits and vegetables	190	127	138	118	119½
4. Grain	150	84	64	96½	102½
5. Woods	40	32	33	37	28
6. Hides	10	6	6	7½	6½
7. Tropical products	100	19	56	8	15
8. Minerals	55	12	22	11	25
9. Tobacco	20	5	6	8	10
10. Hay and chaff	170	108	90	94	94½
11. Wool	110	87	86	104	105
12. Enlarged photographs	5	2	1	5	3
13. Ladies' work	30	21	19	23	24
14. Effective arrangement	80	36	75	70	37
Totals	1,250	765	758	794	774

ONE-FARM EXHIBITS.

There were four competitors in the one-farm section, three of whom made their first entry as exhibitors. The result was a win for Mr. K. Haag, of Teviotville, Fassifern. Following are the details:—

—	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(1) Dairy Produce (50)—					
Butter, 6 lb.	25	19	17	22	17
Cheese, 1 large and 2 small ..	20	9	13	..	10
Eggs, 1 dozen	5	3	3	4½	2
	50	31	33	26½	29
(2) Foods (65)—					
Hams, 15 lb.; bacon, 15 lb. ..	20	17	9	15	12
Corned, smoked, and spiced beef and mutton, 10 lb.	10	8	5	7	6
Honey, 12 lb.	10	4	7	..	6
Beeswax, 6 lb.	5	5	5	4	5
Bread, 2 loaves; scones, 1 dozen	5	2	3	5	4
Confectionery and sweets, 3 lb. ..	5	1	5	3	4
Cakes, &c.	5	1	4	3	3
Lard, tallow, oils	5	3	3	3	3
	65	41	41	40	43

ONE-FARM EXHIBITS—*continued.*

—	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(3) FRUITS, VEGETABLES, AND ROOTS—fresh and preserved (143)—					
Fresh fruits, all kinds	25	10	14	11	12
Dried fruits	10	4	5	4	8
Preserved fruits and jams ..	15	5	14	12	12
Fresh vegetables	15	10	12	9	6
Pickles, sauces, &c.	15	4	14	11	11
Potatoes, 56 lb. (or collection and roots)	25	16	23	18	17
Table pumpkins, squashes, and marrows, 56 lb.	10	6	10	9	8
Cocoanuts and nuts	3	1	2	2	3
Vegetable and garden seeds, 5 lb.	5	..	5	4	5
Arrowroot, 10 lb.	5	..	5	5	4
Cassava, 3 lb.	5	..	..	3	..
Ginger, 3 lb.	5	..	..	..	..
Sugar beet, 3 lb.	5	3	..	..	3
	143	59	104	88	89
(4) GRAIN, &c. (65)—					
Wheat	25	12	8	4	20
Maize	20	7	16	10	18
Barley	20	16	14	7	14
	65	35	38	21	52
(5) TROPICAL PRODUCTS (45)—					
Sugar-cane, 24 stalks or 1 stool ..	30	5	12	20	..
Cotton, in seed, 10 lb., long staple	10	5	5	9	4
Coffee, 10 lb.	5	..	..	3	..
	45	10	17	32	4
(6) TOBACCO leaf, dried, 5 lb. ..	10	..	..	8	3
(7) HAY, CHAFF, &c. (117)—					
Hay, oaten, wheaten, lucerne, and other varieties	20	6	14	14	18
Grasses and their seeds, including canary	10	4	10	8	9
Chaff, oaten, wheaten, lucerne, and other varieties	20	11	19	12	13
Ensilage, any form	15	..	14	..	12
Cattle fodder, pumpkins, and green fodder	15	12	15	14	14
Sorghum and millet	10	5	3	10	10
Hemp, 5 lb.	5	..	4	4	..
Flax, 5 lb.	5	..	4	4	4
Cowpea seed, 7 lb.	7	6	6	5	6
Broom millet	10	..	9	9	8
	117	44	103	80	94
(8) WOOL (25)—					
Greasy, 5 fleeces	20	17	17	16	17
Mohair	5	..	..	4	..
	25	17	17	20	17
(9) DRINKS, &c. (10)—					
Temperance drinks, 6 bottles ..	10	5	7	6	4

ONE-FARM EXHIBITS—*continued.*

—	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(10) WOMEN'S AND CHILDREN'S WORK (30)—					
Needlework, knitting	7	3	7	7	4
Fine arts	3	..	3	2	1
School work, maps, writing, &c.	10	7	..	6	..
Fancy work	10	6	9	8	3
	30	16	19	23	8
(11) Miscellaneous articles of commercial value	5	3	4	4	5
(12) Plants and flowers, in pots ..	5	2	5	3	3
(13) Time and labour saving useful articles, made on the farm ..	10	10	6	8	6
(14) Effective arrangement of exhibits	10	7	9	8	10
(15) Arrangement of stand ..	5	3	5	4	5
(16) Effective ticketing	5	4	5	4	5
(17) General finish	10	5	8	8	10
	50	34	42	39	44
Grand totals	610	292	421	383½	387

MILKING TESTS.

Subjoined are the details of the milking tests conducted in connection with the Exhibition. Judges: Messrs. R. W. Winks and L. F. Anderson, Brisbane.

COW, 4 YEARS OLD AND OVER, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk. Lb.	Commercial Butter.	Pts. Butter Fat, 24 Hours.	Lact. Points.	Total Points.
Lawrence's Charmer 2nd of City View	M.	22·3	1·180	..	..	..
	E.	19·5	1·451	..	..	..
	M.	16·5	·978	..	..	..
	E.	17·11	1·307	..	..	..
		75·8	4·916	39·32	10	49·32
A. Pickel's Royal 4th of Blacklands	M.	20·14	1·640	..	..	..
	E.	18·7	1·545	..	..	..
	M.	18·12	1·361	..	..	..
	E.	18·4	1·437	..	..	..
		76·5	5·983	47·86	..	47·86
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie 3rd of Nestles	M.	29·0	·876	..	..	..
	E.	32·12	1·380	..	..	..
	M.	29·14	1·036	..	..	..
	E.	27·14	1·265	..	..	..
		119·8	4·557	36·4	..	36·4
M. Lawrence's Princess of City View	M.	22·10	·975	..	..	..
	E.	19·11	·967	..	..	..
	M.	22·0	·920	..	..	..
	E.	18·0	1·040	..	..	..
		82·5	3·902	31·21	3·4	34·61
B. O'Connor's Tulip IV. of Hill View	M.	25·8	·945	..	..	..
	E.	24·6	1·162	..	..	..
	M.	25·5	1·092	..	..	..
	E.	23·12	1,100	..	..	..
		98·15	4·299	34·38	..	34·38
B. O'Connor's Wakeful of Oakvale	M.	25·12	·803	..	..	..
	E.	26·0	1·280	..	..	..
	M.	24·14	1·105	..	..	..
	E.	24·4	1·080	..	..	..
		100·14	4·268	34·14	..	34·14
P. Moore's Lovely of Sunnyside ..	M.	23 9	·757	..	..	..
	E.	16·15	1·010	..	..	..
	M.	21·7	1·201	..	..	..
	E.	21·0	1·010	..	..	..
		82·13	3·978	31·82	1·9	33·72

MILKING TESTS—*continued*

—	—	Milk. Lb.	Commercial Butter.	Pts. Butter Fat, 24 Hours.	Lact. Points.	Total Points.
S. H. Hosking's Margaret Anglin 2nd of Berry	M.	21·3	·616	..	..	..
	E.	21·8	·870	..	..	..
	M.	22·10	·684	..	..	..
	E.	22·4	·930	..	..	..
		87·9	3·100	24·8	8·9	33·7
B. O'Connor's Dahlia 2nd of Hillview	M.	28·15	1·028	..	..	..
	E.	26·4	·977	..	..	..
	M.	29·10	1·029	..	..	..
	E.	27·7	1·013	..	..	..
		112·4	4·047	32·36	..	32·36
Livingston Bros.' Young Duchess 4th	M.	24·6	·841	..	..	..
	E.	20·1	·932	..	..	..
	M.	26·6	1·135	..	..	..
	E.	21·8	·980	..	..	..
		92·5	3·888	31·1	1·2	32·3
A. Pickel's Jean V. of Blacklands	M.	22·11	·861	..	..	..
	E.	19·13	·634	..	..	..
	M.	22·1	·741	..	..	..
	E.	18·9	·637	..	..	..
		83·2	2·873	22·98	8·9	31·87
S. H. Hosking's Duchess of Hanover of Berry	M.	28·4	·755	..	..	..
	E.	28·4	·947	..	..	..
	M.	30·0	·940	..	..	..
	E.	28·15	1·138	..	..	..
		115·7	3·780	30·24	..	30·24
Jackson and Schofield's Butter Maid 2nd	M.	16·10	·695	..	..	..
	E.	16·3	·859	..	..	..
	M.	17·4	·677	..	..	..
	E.	16·1	·792	..	..	..
		66·2	3·023	24·19	1·3	25·5

Cow, 4 Years and over, averaging the Greatest Daily Yield of Butter Fat for 48 Hours.

—	—	Milk. Lb.	Test.	Commercial Butter. Lb.
A. Pickel's Royal 4th of Blacklands	M.	20·14	6·7	1·640
	E.	18·7	7·1	1·545
	M.	18·12	6·2	1·361
	E.	18·4	6·7	1·437
		76·5	..	5·983
M. Lawrence's Charmer II. of City View	M.	22·3	4·5	1·180
	E.	19·5	6·4	1·451
	M.	16·5	5·1	·978
	E.	17·11	6·3	1·307
		75·8	..	4·916

MILKING TESTS—*continued.*

—	—	Milk. Lb.	Test.	Commercial Butter. Lb.
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie III. of Nestles	M.	29·0	2·6	·876
	E.	32·12	3·6	1·380
	M.	29·14	3·0	1·036
	E.	27·14	3·9	1·265
		119·8	..	4·557
B. O'Connor's Tulip IV. of Hillview	M.	25·8	3·2	·945
	E.	24·6	4·1	1·162
	M.	25·5	3·7	1·092
	E.	23·12	4·0	1·100
		98·15	..	4·299
B. O'Connor's Wakeful of Oakvale	M.	25·12	2·7	·803
	E.	26·0	4·2	1·280
	M.	24·14	3·8	1·105
	E.	24·4	3·8	1·080
		100·14	..	4·268
B. O'Connor's Dahlia II. of Hillview	M.	28·15	3·1	1·028
	E.	26·4	3·2	·977
	M.	29·10	3·0	1·029
	E.	27·7	3·2	1·013
		112·4	..	4·047
P. Moore's Lovely of Sunnyside	M.	23·9	2·8	·757
	E.	16·13	5·1	1·610
	M.	21·7	4·8	1·201
	E.	21·0	4·1	1·010
		82·13	..	3·978
Livingstone Bros.' Young Duchess IV.	M.	24·6	3·0	·841
	E.	20·1	4·0	·932
	M.	26·6	3·7	1·135
	E.	21·8	3·9	·980
		92·5	..	3·888
S. H. Hosking's Duchess of Hanover of Berry ..	M.	28·4	2·3	·755
	E.	28·4	2·9	·947
	M.	30·0	2·7	·940
	E.	28·15	3·4	1·138
		115·7	..	3·780
(UNDER STANDARD.)				
Jackson and Schofield's Butter Maid II.	M.	16·10	3·6	·695
	E.	16·3	4·5	·859
	M.	17·4	3·4	·677
	E.	16·1	4·2	·792
		66·2	..	3·023

MILKING TESTS—*continued.*

COW OR HEIFER, UNDER 4 YEARS, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk.	Test.	Commercial Butter.
		Lb.		Lb.
E. Burton's Oxford Golden Buttercup.	M.	20·9	4·2	1·002
	E.	19·13	5·0	1·160
	M.	19·10	3·9	·895
	E.	14·13	7·0	1·225
		74·13	..	4·282
M. Lawrence's Present of City View	M.	19·4	4·0	·890
	E.	18·0	5·4	1·150
	M.	17·14	3·5	·725
	E.	19·1	4·9	1·093
		74·3	..	3·858
E. Burton's Oxford Noble Dot II.	M.	15·12	3·7	·680
	E.	17·4	6·4	1·297
	M.	15·9	5·2	·953
	E.	14·0	5·2	·860
		62·9	..	3·790
M. Lawrence's Red Duchess III. of City View ..	M.	18·14	2·6	·570
	E.	17·6	3·2	·641
	M.	20·7	3·4	·803
	E.	19·0	3·8	·850
		75·11	..	2·864
B. O'Connor's Bessie of Oakvale	M.	16·3	3·5	·657
	E.	15·12	3·6	·660
	M.	17·12	3·6	·740
	E.	16·3	3·6	·677
		65·14	..	2·734
Jackson and Schofield's Irene of Bexley	M.	9·15	3·8	·437
	E.	10·6	4·9	·588
	M.	12·10	4·6	·680
	E.	11·8	5·1	·690
		44·7	..	2·395

COW OR HEIFER, UNDER 4 YEARS, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk.	Commercial Butter.	Points Butter Fat, 24 Hours.	Lactation Points.	Total Points.
		Lb.				
R. Mear's Tulip of Morden ..	M.	20·7	·977	..	..	..
	E.	17·3	·847	..	..	..
	M.	20·15	·967	..	..	..
	E.	16·8	·760	..	..	..
		75·1	3·551	28·40	8·8	37·20
E. Burton's Oxford Golden Buttercup	M.	20·9	1·002	..	..	..
	E.	19·13	1·160	..	..	..
	M.	19·10	·895	..	..	..
	E.	14·13	1·225	..	..	..
		74·13	4·282	34·25	..	34·25

MILKING TESTS—*continued.*

—	—	Milk.	Commercial Butter.	Points Butter Fat, 24 Hours.	Lactation Points.	Total Points.
		Lb.				
B. O'Connor's Bessie of Oakvale	M.	16·3	·657	..	..	..
	E.	15·12	·660	..	..	..
	M.	17·12	·740	..	..	..
	E.	16·3	·677	..	..	..
		65·14	2·734	21·87	9·2	31·07
M. Lawrence's Present of City View	M.	19·4	·890	..	..	..
	E.	18·0	1·150	..	..	..
	M.	17·14	·725	..	..	..
	E.	19·1	1·093	..	..	..
		71·3	3·858	30·86	..	30·86
E. Burton's Oxford Noble Dot II.	M.	15·12	·680	..	..	..
	E.	17·4	1·297	..	..	..
	M.	15·9	·953	..	..	..
	E.	14·0	·860	..	..	..
		62·9	3·790	30·32	..	30·32
A. Pickels' Model of Blacklands..	M.	15·2	·593	..	..	..
	E.	14·7	·657	..	..	..
	M.	14·6	·585	..	..	..
	E.	14·7	·637	..	..	..
		58·6	2·472	19·77	9·3	29·07
M. Lawrence's 2nd of City View..	M.	10·14	·455	..	..	..
	E.	9·5	·359	..	..	..
	M.	11·10	·472	..	..	..
	E.	10·6	·435	..	..	..
		42·3	1·721	13·76	..	13·76

COW, UNDER 4 YEARS, GIVING BEST BUTTER FAT RESULTS, AND COMPETING IN THE TWO PREVIOUS SECTIONS, WITH ALLOWANCE FOR LACTATION POINTS IN THE LAST SECTION. THE POINTS SECURED BY THE VARIOUS COMPETITORS WERE SIMILAR TO THOSE IN THE CLASSES MENTIONED.

	Total points.
R. Mear's Tulip of Morden	37·20
R. Burton's Oxford Golden Buttercup	34·25
B. O'Connor's Bessie of Oakvale	31·07

COW YIELDING LARGEST SUPPLY OF MILK IN 48 HOURS.

—	—	Milk, Lb.	Test.
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie III. of Nestle's	M.	29·0	2·6
	E.	32·12	3·6
	M.	29·14	3·0
	E.	27·14	3·9
Total weight	..	119·8	..
B. O'Connor's Dahlia 2nd of Hillview	M.	28·15	3·1
	E.	26·4	3·2
	M.	29·10	3·0
	E.	27·7	3·2
Total weight	..	112·4	..

MILKING TESTS—*continued.*

—	—	Milk, Lb.	Test.
Livingstone Bros.' Young Duchess IV.	M.	24·6	3·0
	E.	20·1	4·0
	M.	26·6	3·7
	E.	21·8	3·9
Total weight	..	92·5	..
S. H. Hosking's Duchess of Hanover of Berry	M.	28·4	2·3
	E.	28·4	2·9
	M.	30·0	2·7
	E.	28·15	3·4
Total weight..	..	115·7	..
(Above under Standard.)			
P. Moore's Lovely of Sunnyside	M.	23·9	2·8
	E.	16·13	5·1
	M.	21·7	4·8
	E.	21·0	4·1
Total weight	..	82·13	..
M. Lawrence's Princess of City View	M.	22·10	3·7
	E.	19·11	4·2
	M.	22·0	3·6
	E.	18·0	4·9
Total weight	..	82·5	..
M. Lawrence's Charmer II. of City View	M.	22·3	4·5
	E.	19·5	6·4
	M.	16·5	5·1
	E.	17·11	6·3
Total weight	..	75·8	..

Special competition for Cows, 4 years old and over, averaging the greatest daily yield of butter fat for 48 hours, for which competition was conducted in the second of the foregoing classes.

	Commercial Butter.
A. Pickels' Royal 4th of Blacklands	5·983
M. Lawrence's Charmer 2nd of City View	4·916
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie 3rd of Nestles ..	4·557

ROYAL NATIONAL CHAMPION BUTTER FAT TEST FOR COW (ANY BREEDING), AVERAGING THE GREATEST YIELD OF BUTTER FAT, 48 HOURS (UNDER THE BABCOCK TEST), AND WHICH HAS BEEN THE PROPERTY OF THE EXHIBITOR THREE MONTHS BEFORE THE ENTRY. Special Prize of £25, and a cash prize of £2 2s. to the winner.

—	—	Milk, Lb.	Commercial Butter.	Points Butter Fat, 24 hours.	Lactation Points.	Total Points.
M. Lawrence's Charmer 2nd of City View (Illawarra Milking Shorthorn)	M.	22·3	1·180	..	..	..
	E.	19·5	1·451	..	..	..
	M.	16·5	·978	..	..	..
	E.	17·11	1·307	..	..	..
		75·8	4·916	39·32	10	49·32
Winner, 1920— B. O'Connor's Charm of Glenthorn (Illawarra)	..	121·8	6·76	..	..	..

CHAMPION BUTTER TEST.

The Royal National Champion Butter Fat Test for a £25 special prize and a cash prize of £2 2s. yearly to the winner, creates considerable interest among dairymen. The Prize is given for the cow of any breed averaging the greatest daily yield of butter fat for 48 hours under the Babcock test. This year the prize was won by Mr. Lawrence's Illawarra Milking Shorthorn, Charmer 2nd of City View. Previous winners were :—1912, D. Dunn's Blossom III. ; 1913, McIntyre Bros.' Fancy ; 1914, A. Pickels' Florrie of Blacklands ; 1915, C. Bloss's Canary ; 1916, D. Dunn's Blossom III. ; 1917, Marquardt Bros.' Champion ; 1918, H. Benbow's Joyce ; 1919, no show held ; 1920, B. O'Connor's Charm of Glenthorn.

HOME MILKING.

Cows or heifers in all competitions averaging the greatest daily yield of butter fat for 48 hours, under Babcock test, milk to contain on an average not less than 3 per cent. of butter fat :—

Ayrshires.

—	—	Milk. Lb.	Test.	Commercial Butter Fat.
J. N. O. Anderson's Jeanette R. 3rd of Ivercauld ..	M.	26	3·8	1·16
	E.	25½	4·2	1·25
	M.	24½	5·2	1·49
	E.	25½	3·6	1·07
		101½	..	4·97
Livingstone Bros.' Young Duchess 4th	M.	31	3·0	1·08
	E.	23½	4·0	1·09
	M.	30	3 0	1·04
	E.	25	3·9	1·14
		109½	..	4·35
Jerseys.				
T. Mullen's Lady Lass 3rd	M.	21	4·8	1·18
	E.	20	5·2	1·22
	M.	20	5·2	1·22
	E.	24	5·0	1·42
		85	..	5·04
T. Mullen's Aldans Rosie	M.	20¼	5·8	1·385
	E.	21	4·5	1·11
	M.	22¼	5·4	1·415
	E.	21	4·4	1·08
		84½	..	4·990
Illawarra Milking Shorthorns.				
B. O'Connor's Charm of Glenthorn	M.	37·5	4·35	1·91
	E.	30·0	5·3	1·87
	M.	36·5	4·4	1·88
	E.	30·0	5·2	1·9
		134	..	7·56
M. Lawrence's Charm of 2nd of City View	E.	28½	3·6	1·19
	M.	30½	3·0	1·055
	N.	32	4·0	1·50
	E.	26½	4·4	1·365
	M.	30½	3·0	1·055
	N.	29	3·9	1·32
		177	..	7·485

HOME MILKING—*continued.*

—	—	Milk. Lb.	Test.	Commercial Butter Fat.
Friesians.				
P. P. Falt's Oakley Noreen	M.	31	4·2	1·53
	E.	30	5·0	1·77
	M.	30	5·6	1·98
	E.	31	5·0	1·82
		122	..	7·10
P. P. Falt's Dairymaid	M.	31	3·6	1·30
	E.	29	3·8	1·29
	M.	33	4·0	1·54
	E.	29	4·1	1·40
		122	..	5·33
G. Newman's Colantha Queen Segis	M.	33½	3·4	1·315
	E.	27½	4·3	1·385
	M.	32½	3·5	1·32
	E.	26½	4·3	1·335
		120	..	5·355
Grindles Ltd.'s Colantha Johanna Creamelle	M.	28	3·45	1·13
	E.	32	3·00	1·11
	M.	31	3·00	1·08
	E.	29	4·70	1·60
		120	..	4·92

A special prize, awarded to the Queensland Stud Book cow or heifer of the four breeds in the Home Milking Competitions giving the best butter fat results, was awarded to B. O'Connor's Charm of Glenthorne (Illawarra).

BACON AND HAMS.

Mr. G. S. Stening (Sydney) judged the bacon, hams, and by-products, in the dairy produce section. J. C. Hutton Propty., Ltd., Brisbane, won the competitions in factory bacon, factory-cured hams, smoked sausages, and lard, gaining a high percentage of marks. The awards in the section are as follows :—

BACON, SIX SIDES, FACTORY CURED.

—	Flavour.	Texture and Firmness.	Portion of Fat and Lean.	Butchering and Finish.	Smoking.	Colour.	Total.
Possible points	45	10	10	10	10	15	100
J. C. Hutton Propty., Ltd., Brisbane	43	9	9½	7	9	13½	91
J. C. Hutton Propty., Ltd., Brisbane	43½	9	8½	7	9	13½	90½
Queensland Co-operative Bacon Co., Ltd., Murarrie	43½	8	9	8	8½	13	90
J. C. Hutton Propty., Ltd., Canterbury, N.S.W.	43	7	8	7	8	13	86
Foley Bros., Lismore, N.S.W.	42	6½	9	7	8	12½	85
BACON, FARMERS', TWO SIDES, CURED.							
D. Dunn, Valley View, Beaudesert	42	8	8	7	7	13	85

BACON AND HAMS—*continued.*

——	Flavour.	Texture and Firmness.	Portion of Fat and Lean.	Butchering and Finish.	Smoking.	Colour.	Total.
HAMS, SIX, FACTORY CURED.							
J. C. Hutton, Propty. Ltd., Brisbane	43½	9	9	8½	9	13	92
J. C. Hutton Propty., Ltd., Brisbane	43½	8½	9	8½	9	13	91½
Queensland Co-operative Bacon Co., Ltd., Murarrie	43	8	8½	8½	9½	12½	90
J. C. Hutton Propty., Ltd., Canterbury, N.S.W.	43	7½	8½	8	9	12½	88½
Foley Bros., Ltd., Lismore, N.S.W.	42½	6½	7	8½	9	13	86½
HAMS, FARMERS' TWO BEST CURED.							
D. Dunn, Valley View, Beaudesert	42½	8	9	8	7	12½	87

LARD, IN BLADDERS, 14 LB.

——	Flavour.	Texture.	Colour.	Finish and appearance.	Total.
Possible points	40	25	25	10	100
J. C. Hutton Propty., Ltd., Brisbane ..	37½	25	24½	10	97
Queensland Co-operative Bacon Co., Ltd., Murarrie	38	24½	23½	10	96
J. C. Hutton Propty., Ltd., Brisbane	37	20	24	10	91
Foley Bros., Ltd., Lismore, N.S.W.	36½	24	23	7	90

SAUSAGE, SMOKED, 14 LB.

J. C. Hutton Propty., Ltd., Brisbane, 1.
Queensland Co-operative Bacon Co., Ltd., Murarrie, 2.

HEN EGGS, DOZEN, TO BE JUDGED BY WEIGHT.

J. G. Argo, Chermside, 1.
A. J. Cain, Spring Hill, 2.

JUDGE'S FAVOURABLE CRITICISM.

Satisfaction with the section was expressed by the judge, who remarked that the exhibits were of a fairly high order, and showed an improvement, both in quality and texture, on those of last year. The winning exhibit in bacon sides was exceptionally good, and would be difficult to excel, in so far as flavour and texture were concerned. Points were lost, however, in butchering, mainly caused by inferior scalding. The ham classes, too, were particularly good, and compared favourably with those of other shows. The minor exhibits, sausages and lard, were very fine in quality.

THE APIARY SECTION.

The Queensland Beekeepers' Association has benefited the apiary industry immensely by advocating and demonstrating the employment of modern methods and the application of science to honey production and extraction. Queensland honey ranks with the world's best for colour, flavour, and density. The industry is capable of great expansion, as many tons go to waste for lack of bees to gather it and beekeepers to harvest it. The competition in the extracted honey classes at the Show was very keen. An educative exhibit was a sectional view of a modern beehive, with a numbered descriptive chart attached. Two others by the same exhibitor, Mr. A. J. Wheeler, attracted much attention. One was a case showing the number of uses to which beeswax may be put, and a second demonstrated the medicinal value of honey.

THE AWARDS.

Extracted Honey.—Light: A. Smith 1, A. Douglas 2, A Gambling 3; golden: A. Gambling 1 and 2, P. Ward 3; dark: A. Gambling 1 and 2, W. K. Holmans 3; fine grain: A. Gambling 1, A. T. Baker 2, P. Ward 3; coarse: P. Ward 1 and 2, A. T. Baker, 3; comb and extracted: A. Douglas 1, S. L. Uhlmann 2, P. Ward 3; solid: P. Ward 1, A. T. Baker 2, A. J. Wheeler 3.; novice class: S. L. Uhlmann. Jar extracted honey: P. Ward. Comb honey, 12 1 lb. sections: A. Gambling. Frame of comb honey: P. Ward. Not less than 100 square inches: P. Ward. Beeswax, natural yellow: P. Ward; white: A. Smith. 4 lb. tablets: S. L. Uhlmann. Yellow tablets: P. Ward. Trophy form: A. Gambling. Modes of using beeswax: A. J. Wheeler. Trophy of apiary products: A. T. Baker 1, A. Gambling 2, A. Smith 3. Hives, &c.—Observatory hive: A. J. Wheeler; foundation for comb and sections: P. Ward. Honey cookery.—Honey vinegar: P. Ward. Collection of confectionery and cakes: Mrs. A. Pitkeathly. Articles showing medical use of honey: A. J. Wheeler. Champion prize for honey exhibited in classes 1, 2, 3, 8, and 9: Alex. Smith, Redbank.

FARM PRODUCE—THE AWARDS.

(Judges: Agricultural produce, Mr. H. C. Quodling; cotton, rubber, oils, &c., Mr. D. Jones.)

Cereals.—Maize, large yellow, period of maturity 5 to 6 months: J. H. Littleton 1 and 2; Yellow Dent (any district variety other than Hawkesbury champion or so-called Golden King): H. Franke; yellow peg tooth type (to include so-called "lady's finger," and long thin grains of this kind): H. C. Harvey 1, H. Franke 2; small yellow, period of maturity 100 to 120 days, Early Leaming (to include "Star" and "Gold Standard" Leaming): H. Franke 1, A. E. Price 2; Early Yellow Dent (or other distinct varieties): H. Franke; so-called 90-day, period of maturity 90 to 100 days: H Franke; white varieties, large white (Hickory King not eligible): H. Franke; Hickory King: C. Behrendorff; Boone County White (Silvermine, or other distinct white type): A. Loweke; Brazilian white: C. Behrendorff; red varieties, Sydney Red: H. Franke; Red Butcher: J. Stenzel 1 and 2; small Early Red (to include red-coloured Leaming, or any other early variety, with a distinct shade of red): H. Franke 1, H. C. Harvey 2; any variety, 10 lb.: H. Franke; popcorn any variety, 10 lb.: J. Donges; maize "ears," medium yellow: H. Franke; small yellow: H. Franke; any white variety: A. Loweke 1, H. Franke 2; red: H. Franke; red, small grain (early): A. E. Price 1, H. Franke 2; popcorn: J. Donges; champion best exhibit maize, yellow: J. H. Littleton; white champion: H. Franke. Wheat, medium, strong, flour wheat: Wm. Auchter; weak flour wheat, Wm. Auchter; grand champion prize best exhibit wheat, 2 bags, any variety: Wm. Bridge 1, G. Alexander 2 and 3. Barley, malting barley, 1 bushel (Chevalier or Battledoor type): Wm. Taylor 1, E. W. Jackson 2; malting barley, 1 bushel (Sea of Azov type): Wm. Taylor; Cape barley, 1 bushel: D. Hammond, 2; champion malting barley: Wm. Taylor. Oats, Algerian, or Sunrise oats, 1 bushel: C. Behrendorff 1, H. Franke 2. Hay, chaff, and ensilage, lucerne hay, best, dry, green coloured: B. C. Bell 1, J. Campbell 2; lucerne hay, sweated: J. Campbell; oaten hay: C. Behrendorff 1, J. Donges 2; wheaten hay: Wm. Auchter; Soudan grass hay: H. Franke 2; millet or panicum hay, any kind: H. Franke 2; 3 sheaves oaten hay, Algerian: H. W. Berlin 1, J. Donges 2; 3 sheaves oaten hay, Tartarian: H. W. Berlin; 3 sheaves wheaten hay: Wm. Auchter 1, H. W. Berlin 2; chaff, lucerne chaff, 1 bag, cut from prime, dry, green-coloured hay: H. W. Berlin 1, B. C. Bell 2; lucerne chaff, 1 bag, cut from prime, sweated hay: J. Campbell 1, J. Donges 2; wheaten chaff, 1 bag, best cut, screened, and bright, cut from prime hay: Leslie Auchter 1, Wm. Auchter 2; "canary" chaff, 1 bag, best cut, screened, and bright, cut from prime hay: H. Franke 2; Soudan grass, 1 bag, best cut, screened, cut from prime, fine stalked, leafy hay: H. Franke; millet or panicum chaff, 1 bag, any kind, cut from prime hay: K. Haag 1, H. W. Berlin 2; grass hay chaff, 1 bag, any kind, cut from artificial or native grasses: H. Franke 2; wheaten straw chaff, 1 bag: J. Campbell; straw chaff (any other kind): J. Campbell 1, H. Franke 2; ensilage (chaff), approx. 56 lb. maize, or other fodder: C. Behrendorff; green fodder, best collection, suitable for milch cows: H. Franke 1, J. Donges 2; agricultural and market garden seeds, sorghums and millet, grain sorghum non-saccharine), cream, standard or dwarf milo, 30 lb.: H. Franke 2; red Kafir corn, 30 lb.: H. Franke; saccharine, sorghums, saccaline (so-called), 30 lb.: E. J. Keys; sorghum saccharatum, 30 lb.: H. Franke; planter's friend (so-called imphee), 30 lb.: K. Haag 2; Amber cane, 30 lb.: K. Haag; Soudan grass, 30 lb.: H. Franke; panicum and fodder millets, white seeded French millet, 30 lb.: T. Fisher; Japanese millet, 30 lb.: H. W. Berlin 1, K. Haag 2; white panicum, 30 lb.: H. W.

Berlin. Pasture grass seeds.—Lucerne seed, Queensland grown, broad leaf, Hunter River variety, 30 lb.: C. Behrendorff 1, B. C. Bell 2; Sisal hemp fibre, one bundle, 3 to 4 in. in diameter: F. M. Schleger. Beans and peas, cowpeas (black), 30 lb.: K. Haag. Cowpeas (clay coloured), 30 lb.: K Haag. Yorkshire Hero peas or any other variety, 10 lb.: K. Haag. Miscellaneous.—Canary seed of commerce, 30 lb.: E. W. Jackson. Tropical produce.—Sugar-cane, five canes, any kind, with tops on, 16 months and under, grown in red soil: F. M. Schleger. Sugar-cane, 5 canes, any kind, with tops on, 16 months and under, grown in other than red soil: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, 5 canes, any kind, with tops on, standover: F. M. Schleger. Sugar-cane, collection good milling varieties, 3 canes of each variety, with tops on: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, stool, any kind, 16 months and under, standover: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, stool, any kind, standover: F. M. Schleger. Sugar-cane, best 5 sticks D. 1135: F. M. Schleger. Sugar-cane, best 5 sticks, 1900 seedling: F. M. Schleger. Sugar-cane, best 5 sticks, any variety of Queensland or Hambledon seedlings, Badila, D. 1135 and 1900 seedling: F. M. Schleger. Sugar-cane, best 5 sticks, any variety of Queensland or Hambledon seedlings: F. M. Schleger. Cotton, upland, in seed, not less than 10 lb.: J. J. Kakebeeke. "The John Reid Crop," and prizes donated by Mrs. John Reid to encourage cotton cultivation in Queensland: J E. Maddox 1, J. J. Kakebeeke 2. Roots, &c., potatoes, blue varieties, Guyrar blues, coronations, or Commonwealths: T. Fisher 1, Louis Ebert 2. Manhattans: C. Seiler 1, Louis Ebert 2. Brownell, any variety other than Satisfaction: T. Fisher 1, H. Franke 2. Satisfaction: Louis Ebert 1, A. Loweke, 2; Scottish Triumphs: A. Leweke. Best collection, not less than six varieties, each 14 lb.: A. Loweke 1, Louis Ebert 2. Sweets, white table variety: Louis Ebert. Sweets, white cattle variety: Miers, Herman. Sweets, red or pink, table variety: J. S. Seeleither 1, Louis Ebert 2. Champion blue potato: T. Fisher. Champion white potato: A. Loweke. Champion Brownell potato: Louis Ebert. Crown pumpkins, table, 3: J. Seeleither 1, H. C. Harvey 2. Ironbark pumpkins, table, 3: H. C. Harvey 1, A. E. Price 2. Marrows, 3: A. E. Price. Piemelons, 3: J. Seeleither 1, Mrs. P. Newton 2. Arrowroot, 3 stools: Miers, Herman 1, H. Franke 2. chicory, green or dry, 10 lb.: J. Donges. Garlic, 3 lb.: F. Franke. Castor oil bean, any variety, 5 lb.: J. Donges. Swedes purple top, ½ cwt.: H. Franke 1, A. E. Price 2. Swedes, any other variety: H. Franke.

SWINE.

(Judge: Mr. W. Fisher.)

Improved Berkshires.—Boar, 2 years and over: W. J. Warburton's Northgate Item; over 6 months and under 1 year: E. Burton's Oxford King; under 6 months: J. H. Cowen's Cremorne Lad 1, J. H. Cowen's Cremorne Sonny 2; champion Berkshire boar, any age: W. J. Warburton's Northgate Item. Sow, 2 years and over: W. J. Warburton's Glad Eye; 1 year and under 2 years: C. Behrendorff's Brentwood Jill 1, Dr. H. B. Ellerton's Serang Maid 2; over 6 months and under 1 year: Dr. H. B. Ellerton's Goodna Queenie 1, E. Burton's Oxford Pearl 2; under 6 months: E. Burton's Oxford Marie 1, J. H. Cowen's Cremorne Bess 2; any age, with litter: E. Burton's Kilbirnie Lex; champion Berkshire sow: W. J. Warburton's Glad Eye.

Yorkshires.—Boar, 2 years and over: W. J. Warburton's Northgate My Lad 1, Queensland Agricultural College's Even Chance 2; 1 year and under 2 years: W. J. Warburton's Northgate Don 1; 6 months and under 1 year: Queensland Agricultural College; under 6 months, W. J. Warburton's boar; champion Yorkshire boar: W. J. Warburton's Northgate My Lad. Sow, 2 years and over: W. J. Warburton's Northgate My Girl; 1 year and under 2 years: W. J. Warburton's Northgate Glads; 6 months and under 1 year: W. J. Warburton's Trisa; under 6 months: W. J. Warburton's Rosetta; champion Yorkshire sow: W. J. Warburton's Northgate My Girl.

Tamworths.—Boar, 2 years and over: J. H. Whittaker's Meddlesome Duke; 1 year and under 2 years: Queensland Agricultural College's Knowle Chatham; 6 months and under 1 year: T. M. Hewitt; under 6 months: William Dredge's Rufus; champion Tamworth boar J. H. Whittaker's Meddlesome Duke. Sow, 2 years and over: J. H. Whittaker's Knowles Princess; 6 months and under 1 year: Queensland Agricultural College's Rosebank Doris 1, T. M. Hewitt 2; under 6 months: J. H. Whittaker's Knowles Gem 1, J. H. Whittaker's Knowles Pearl 2; champion Tamworth sow: J. H. Whittaker's Knowles Princess.

Poland-China.—Sow, 6 months and under 15 months: T. M. Hewitt; pen of three young boars, under 6 months: T. M. Hewitt; pen of three young sows, under 6 months: T. M. Hewitt.

Miscellaneous.—Special prize, presented by Mr. R. G. Watson, for Queensland-bred pig (sow or boar), under 6 months: E. Burton's Oxford Marie; 3 bacon pigs, any breed, 110 to 140 lb. estimated dressed weight: H. McNeilly 1, J. Fitzgerald 2; 3 porker pigs, 60 to 80 lb.: S. Mison 1, C. Bright 2; sow, with litter, any breed: E. Burton's Kilbirnie Lex; pen of 3 Berkshire sows, under 16 weeks: C. Behrendorff 1, E. Burton 2; pen of 3 Yorkshire sows, under 16 weeks: W. J. Warburton; pen of 3 Yorkshire boars, under 16 weeks: W. J. Warburton.

STUD SHEEP.

(Judge: Mr. Edgar Baynes.)

Lincolns.—Ram, any size: S. E. Pullen; ewe, any age: S. E. Pullen.

English Leicesters.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

Romney Marsh.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

Corriedales.—Ram, any age: J. H. Fairfax 1 and 2; ewe, any age: J. H. Fairfax 1 and 2.

Shropshires.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

BUTTER—EXPORT CLASSES.

The first prize went to the Queensland Farmers' Co-operative Co., Ltd., of Laidley, with 93½ points for salted butter and 92½ points for unsalted butter. The details are as follows:—

One Box (Salted), 30 Days' Storage.

—	Flavour.	Texture.	Colour.	Salting.	Packing and finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Co., Ltd., Laidley	59	19½	7	4	4	93½
Downs Co-operative Dairy Co., Ltd., Toowoomba	58½	19½	7	4	4	93
Murrumbidgee Irrigation Areas, Leeton, N.S.W.	58	19½	7	4	4	92½
Logan and Albert Co-operative Dairy Co., Ltd., Beaudesert	54	19	7	4	4	88
Terror's Creek and Samson Vale Dairy Co., Dayboro	56	19	7	4	3½	89½
Downs Co-operative Co., Ltd., Dalby ..	56	19	7	4	4	90
Downs Co-operative Co., Ltd., Clifton ..	56½	19	7	4	4	90½
Downs Co-operative Co., Ltd., Crow's Nest	57	19	7	4	4	91
Caboolture Co-operative Dairy Co., Ltd. Pomona	56	19	7	3	4	89
Gayndah Co-operative Dairy Co., Ltd., Gayndah	57	19	7	4	3½	90½
Oakey Co-operative Dairy Col, Ltd., Oakey	56½	19	6½	4	4	90
Queensland Farmers' Co-operative Co., Ltd.. Booval	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Co., Ltd., Boonah	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Co., Ltd., Grantham	58	19	7	4	4	92

BUTTER—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N.S.W.*	56½	19	7	4	4	90½
Maryborough Co-operative Dairy Co. Ltd., Maryborough	54	19	7	4	4	88
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56½	19	7	4	4	90½
Maryborough Co-operative Dairy Co. Ltd., Biggenden	56½	19	7	4	3½	90
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	56	19	7	3	3½	88½
Wide Bay Co-operative Dairy Co. Ltd., Gympie	56	19	7	3½	3½	89½
Wide Bay Co-operative Dairy Co. Ltd., Cooroy	57	19	7	3½	3½	90
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin	56½	19	7	4	3½	90
Warwick Butter and Dairying Co. Ltd., Mill Hill	56	19	7	4	3½	89½
Warwick Butter and Dairying Co. Ltd., Allora	57	19	7	4	3	90
Warwick Butter and Dairying Co. Ltd., Texas	56	18½	7	4	3	88½
Nanango Co-operative Dairy Co. Ltd., Nanango	56	19	7	4	4	90

ONE BOX (UNSALTED), 8 WEEKS' STORAGE.

—	Flavour.	Texture.	Colour.	Packing.	Total.
Possible points	65	24	7	4	100
Queensland Farmers' Co-operative Dairy Co. Ltd., Boonah	58	23½	7	4	92½
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	58	23	7	4	92
Queensland Farmers' Co-operative Co., Booval ..	57½	23	7	4	91½
Logan and Albert Co-operative Dairy Co. Ltd., Beaudesert	57	23	7	4	91
Terror's Creek and Samson Vale Dairy Co., Dayboro	56½	23	7	3½	90
Downs Co-operative Dairy Co. Ltd., Toowoomba	57	22½	7	4	90½
Downs Co-operative Dairy Co. Ltd., Dalby ..	56	23	7	4	90
Caboolture Co-operative Dairy Co. Ltd., Pomona	56	23	7	4	90
Gayndah Co-operative Dairy Co. Ltd., Gayndah	57	23	7	4	91
Oakey Co-operative Dairy Co. Ltd., Oakey ..	56½	23	7	4	90½
Queensland Farmers' Co-operative Co. Ltd., Grantham	57	23	7	4	91
Queensland Farmers' Co-operative Co. Ltd., Laidley	56½	23	7	4	90½
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N.S.W.	56	23	7	4	90
Maryborough Co-operative Dairy Co. Ltd., Maryborough	56½	23	7	4	90½
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56	23	7	4	90

BUTTER—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Packing.	Total.
Possible points	65	24	7	4	100
Maryborough Co-operative Dairy Co. Ltd., Biggenden	57	23	7	3	90
Wide Bay Co-operative Dairy Co. Ltd., Gympie	56	23	7	4	90
Wide Bay Co-operative Dairy Co. Ltd., Cooroy	55	23	7	4	89
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin	55½	23	7	4	89½
Warwick Butter and Dairying Co. Ltd., Mill Hill	56	23	7	4	90
Warwick Butter and Dairying Co. Ltd., Allora	55	23	7	3	88
Warwick Butter and Dairying Co. Ltd., Texas	55½	23	7	3	88½
Warwick Butter and Dairying Co. Ltd., Goondiwindi	56	23	7	4	90

ONE BOX (SALTED), 8 WEEKS' STORAGE.

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Dairy Co. Ltd., Boonah	58½	19	7	4	4	92½
Queensland Farmers' Co-operative Dairy Co., Ltd., Booval	58	19	7	4	4	92
Wide Bay Co-operative Dairy Co. Ltd., Cooroy	57½	19	7	4	4	91½
Logan and Albert Co-operative Dairy Co., Goombungee	57	19	7	4	4	91
Queensland Farmers' Co-operative Dairy Co. Ltd., Grantham	57	19	7	4	4	91
Queensland Farmers' Co-operative Dairy Co. Ltd., Laidley	56½	19	7	4	4	90½
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N. S. W.	56½	19	7	4	4	90½
Downs Co-operative Dairy Co., Ltd., Crow's Nest	56½	19	7	4	4	90½
Terror's Creek and Samson Vale Dairy Co., Dayboro	57	19	7	4	3	90
Oakey Co-operative Dairy Co. Ltd., Oakey	56	19	7	4	4	90
Downs Co-operative Dairy Co. Ltd., Toowoomba	56	19	7	4	4	90
Downs Co-operative Dairy Co. Ltd., Dalby	56	19	7	4	4	90
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin	55½	19	7	4	4	89½
Downs Co-operative Dairy Co. Ltd., Clifton	55½	19	7	4	4	89½
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56	19	7	3½	4	89½
Warwick Butter and Dairying Co. Ltd., Mill Hill	56	19	7	3	4	89
Wide Bay Co-operative Dairy Co. Ltd., Gympie	55	19	7	4	4	89
Maryborough Co-operative Dairy Co. Ltd., Maryborough	55½	19	7	3½	4	89
Gayndah Co-operative Dairy Co. Ltd., Gayndah	55	19	7	4	3½	88½
Maryborough Co-operative Dairy Co. Ltd., Biggenden	55½	19	7	3½	3½	88½
Warwick Butter and Dairying Co. Ltd., Goondiwindi	55	19	7	4	3½	88½
Caboolture Co-operative Dairy Co. Ltd., Pomona	55	19	7	4	3	88
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	54½	19	7	3½	4	88
Warwick Butter and Dairying Co. Ltd., Texas	55	19	6½	4	3½	88
Warwick Butter and Dairying Co. Ltd., Allora	55	18½	7	3	4	87½

BUTTER FOR LOCAL MARKETS.

In the factory butter class (local consumption) the Queensland Farmers' Co-operative Dairy Co., Boonah, came first with 93½ points; they also secured the special prize of £5 5s. for the factory securing the greatest aggregate number of points in all classes of butter. Caboolture Co-operative Dairy Co., Ltd., Pomona, second, with 93 points; and Kin Kin Co-operative Dairy Co., Ltd., Kin Kin, third, with 92½ points.

Details are as follows:—

ONE BOX, FACTORY MAKE, LOCAL CONSUMPTION.

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Co., Boonah	59½	19	7	4	4	93½
Caboolture Co-operative Dairy Co., Pomona	59	19	7	4	4	93
Kin Kin Co-operative Dairy Co., Kin Kin	58½	19	7	4	4	92½
Maryborough Co-operative Dairy Co., Kingaroy	58	19	7	4	4	92
Warwick Butter and Dairying Co., Goondiwindi	58	19	7	4	4	92
Terror's Creek and Samson Vale Dairy Co., Dayboro	58½	19	7	4	3	91½
Queensland Farmers' Co-operative Co., Laidley	57½	19	7	4	4	91½
Wide Bay Co-operative Dairy Co., Gympie	58	19	7	3½	4	91½
Warwick Butter and Dairying Co., Mill Hill	57½	19	7	4	4	91½
Nanango Co-operative Dairy Co. Ltd., Nanango	57½	19	7	4	4	91½
Logan and Albert Co-operative Dairy Co., Beaudesert	57	19	7	4	4	91
Wide Bay Co-operative Dairy Co., Cooroy	57	19	7	4	4	91
Downs Co-operative Dairy Co., Toowoomba	57½	19	7	3½	4	91
Downs Co-operative Dairy Co., Clifton ..	57	19	7	4	4	91
Astonville Co-operative Dairy Co., Astonville	57	19	7	4	4	91
Queensland Farmers' Co-operative Co., Booval	56½	19	7	4	4	90½
Queensland Farmers' Co-operative Co., Grantham	57	19	7	3½	4	90½
Maryborough Co-operative Dairy Co., Maryborough	57	19	7	3½	4	90½
Warwick Dairy and Butter Co., Allora ..	57	19	7	4	3½	90½
Downs Co-operative Dairy Co., Crow's Nest	56½	19	7	4	4	90½
Gayndah Co-operative Dairy Co., Gayndah	56½	19	7	3½	4	90
Oakey Co-operative Dairy Co., Oakey ..	56	19	7	4	4	90
Maryborough Co-operative Dairy Co., Mundubbera	56	19	7	3½	4	89½
Downs Co-operative Dairy Co., Dalby ..	56	19	7	4	3½	89½
Maryborough Co-operative Dairy Co., Biggenden	55	19	7	3½	3½	88

BUTTER FOR LOCAL MARKETS—*continued.*

GREATEST AGGREGATE NUMBER OF POINTS.

Special prize of £5 5s. for factory securing the greatest aggregate number of points in all classes of butter.

—	Export Butter.	8 Weeks' Storage.	Box Butter.	Fresh Butter.	Total.
Queensland Farmers' Co-operative Co., Boonah ..	92	92½	92½	93½	370½
Queensland Farmers' Co-operative Co., Booval ..	92	91½	92	90½	366
Queensland Farmers' Co-operative Co., Laidley ..	93½	90½	90½	91½	366
Queensland Farmers' Co-operative Co., Grantham	92	91	91	90½	364½
Downs Co-operative Dairy Co., Toowoomba ..	93	90½	90	91	364½
Kin Kin Co-operative Dairy Co., Kin Kin ..	90	89½	89½	90½	361½
Wide Bay Co-operative Dairy Co., Cooroy ..	90	89	91½	91	361½
Logan and Albert Co-operative Dairy Co., Beaudesert	88	91	91	91	361
Terror's Creek and Samson Vale Dairy Co., Dayboro	89½	90	90	91½	361
Oakey Co-operative Dairy Co., Oakey	90	90½	90	90	360½
Caboolture Co-operative Dairy Co., Pomona ..	89	90	88	93	360
Gayndah Co-operative Dairy Co., Gayndah ..	90½	91	88½	90	360
Wide Bay Co-operative Dairy Co., Gympie ..	89½	90	89	91½	360
Warwick Butter and Dairying Co., Mill Hill ..	89½	90	89	91½	360
Downs Co-operative Dairy Co., Dalby	90	90	90	89½	359½
Maryborough Co-operative Dairy Co., Maryborough	88	90½	89	90½	358
Maryborough Co-operative Dairy Co., Mundubbera	88½	92	88	89½	358
Maryborough Co-operative Dairy Co., Biggenden	90	90	88½	88	356½
Warwick Butter and Dairying Co., Allora ..	90	88	87½	90½	356
Maryborough Co-operative Dairy Co., Kingaroy..	90½	90	89½	92	352
Downs Co-operative Dairy Co., Crow's Nest ..	91	..	90½	90½	272
Downs Co-operative Dairy Co., Clifton	90½	..	89½	91	271
Dorrigo Co-operative Dairy Co., Dorrigo, N.S.W..	90½	90	90	..	271
Warwick Butter and Dairying Co., Goondiwindi	..	90	88½	92	270½
Warwick Butter and Dairying Co., Texas ..	88½	88½	88	..	265

CHEESE—EXPORT CLASSES.

The following are details of the points awarded :—

Two Export Cheeses, 70-80 lb. (not more than three weeks' old prior to storing). White, suitable for English market :—

—	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points	50	25	15	10	100
Goombungee Co-operative Dairy Co., Goombungee	43½	25	15	9	92½
Downs Co-operative Dairy Co. Ltd., Hodgson's Vale	42½	25	15	9½	92
Biddeston Co-operative Dairy Co. Ltd., Wellcamp	42½	25	14½	9½	91½
Kooroongarra Co-operative Dairy Co. Ltd., Kooroongarra	42	25	15	9½	91½
Pittsworth Dairy Co. Ltd., Pittsworth	42	24	15	9½	91
Gayndah Co-operative Dairy Co. Ltd., Byrnestown	43	24	14½	8½	90

CHEESE—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points	50	25	15	10	100
Greenmount Dairy Co. Ltd., "H." Factory ..	42	24	14½	9½	90
Greenmount Dairy Co. Ltd., "G" Factory ..	42	24	15	9	90
Warwick Butter and Dairying Co. Ltd., Bony Mountain	41	24	14	9	88
Oakey Co-operative Dairy Co. Ltd., Cross Hill ..	41	24	14½	8	87½

Two Export Cheeses, 70-80 lb. (not more than three weeks' old prior to storing). Coloured, suitable for English market :—

Pittsworth Dairy Co. Ltd., Pittsworth	44	25	15	9½	93½
Downs Co-operative Dairy Co. Ltd., Hodgson's Vale	44½	25	14	9½	93
Pittsworth Dairy Co. Ltd., Brookstead	43	25	15	9½	92½
Goombungee Dairy Co. Ltd., Goombungee ..	43	24½	15	9½	92
Greenmount Dairy Co. Ltd., "H" Factory ..	43	24½	15	9½	92
Greenmount Dairy Co. Ltd., "G" Factory ..	42½	25	15	8½	91
Southbrook Co-operative Dairy Co. Ltd., Southbrook	41	25	15	9	90
Kooroongarra Co-operative Dairy Co. Ltd., Kooroongarra	42	24½	14	9½	90
Warwick Butter and Dairying Co. Ltd., Victoria Hill	41	24½	15	9½	90
Warwick Butter and Dairying Co. Ltd., Bony Mountain	40½	25	15	9	89½
Warwick Butter and Dairying Co. Ltd., Pratten	41	24½	14½	9½	89½
Gayndah Co-operative Dairy Co. Ltd., Byrnestown	41	24	14	9	88
Karrajong Cheese Factory, Jimbour	39	24	14	8½	85½
Oakey Co-operative Dairy Co., Cross Hill ..	40	24	14	8½	85½
Downs Co-operative Dairy Co., Gowrie Junction ..	38	24½	14½	9	86
Biddeston Co-operative Dairy Co., Wellcamp ..	38	24½	14½	8½	85½

SHOW LECTURES.

Dairy cattle breeders and others interested attended in large numbers two informative lectures under the presidency of Mr. W. J. Affleck in the course of Show week.

THE DAIRY PRODUCE ACT.

Mr. E. Graham, Chief Dairy Expert, lectured on the new Dairy Produce Act. He pointed out that it superseded the *"Dairy Produce Acts,* 1904-11." The need for the new legislative measure was occasioned by the advancement that had been made in dairying during the latter years as a result of the improvement and the introduction of additional scientific measures. In framing the Act care was taken to inquire into the measures that governed dairying in other countries. In the main, the 1920 Act contained all that was found useful and beneficial to the industry in the 1904 Act. In addition, some further provisions had been added which it was thought would be for the betterment of the industry. Amongst the principal alterations was that dealing with registrations of dairies. Formerly registration was an annual matter, but under the new Act when a dairy was once registered the registration would remain in force indefinitely. The new Act further required that those engaged in dairy work might be called upon to produce a certificate of good health. Cream manifestly affected by putrefactory decomposition was not to be received for the manufacture into butter, and cream containing more than .66 per cent. of lactic acid should not be classified as first grade in quality for butter-making, and milk containing more than .25 per cent. of lactic acid should not be classified as first-grade quality for cheesemaking. Apparatus for cleaning the hands of the milkers

and udders of the dairy cows was to be provided. A notice of epizootic or contagious disease amongst stock was required. Factories manufacturing dairy produce were required under the Act to distribute any overrun made by them *pro rata* each month amongst those supplying milk or cream. There had been, too, an alteration in the standard for cream for certain months of the year. Those were the principal alterations of the Act. While it was recognised they were to a great extent minor, they should not alarm those who had the interests of the industry at heart, and desired to assist in the maintenance of the good reputation of this State as a producer in dairy foodstuffs.

DISEASES OF DAIRY CATTLE.

The prevention of disease in dairy cattle with special reference to contagious mammitis was dealt with by Mr. McEachern, a qualified veterinary surgeon. In introducing the subject, the lecturer spoke of the importance of the live stock industry. The necessity for healthy, thrifty calves was mentioned, and the various methods of raising calves described. Ailments of calves dealt with included scours, pneumonia, hæmorrhagic septicæmia, and blackleg, and preventive and curative measures were fully explained. Common milk defects were mentioned, and causes given, and some time was devoted to the different forms of mammitis encountered in dairy cows, such as the simple, tubercular, actinomycotic, and contagious. The latter was described as a most disastrous disease, which was of such an insidious character that it was possible for a whole herd to be affected before the owner realised the nature of the trouble. Prevention was better than cure, and if we could check the occurrence of disease by hygienic measures, the country and stockowners would benefit proportionately.

TREATMENT FOR SMALL WORMS IN HORSES.

Sclerostoma Tetracanthum.—This is a small thread-like worm about half an inch long, found chiefly in the large bowel in great numbers. The embryos encyst themselves beneath the mucous membrane. The countless wounds which the worms make in the bowel, and the irritation caused by the encysted larvæ, give rise to enteritis, &c. There is usually associated with this worm another known as the *Sclerostoma equinum.* This worm is about $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches long, grey or reddish grey in colour, with a round knobbish head, and tapering to the tail end. The embryos wander into the blood vessels, causing obstructions giving rise to grave complications.

Treatment.—All suspected animals should be purged by administering a dose of physic, such as 5 to 6 drachms of powdered Barbados aloes with one drachm of powdered ginger given as a drench in a pint of thin gruel, or made into a ball with a little soft soap. After the action of the purgative has ceased, they should be given every day, about one hour before their morning feed, the following powder mixed in a couple of handfuls of damped food:—

Antimony tartrate	2 drachms
Powdered sulphate of iron	1 drachm
Powdered gentian	2 drachms
Powdered aniseed	3 drachms

After six doses they should be given a second active purgative, for the smaller horses and ponies not more than 5 drachms of aloes and 1 drachm antimony tartrate should be given. During the treatment the animals should be kept yarded to prevent the contamination of pastures by excreta, which should be gathered up and burnt, and the ground dressed with common salt or quick lime. As infested animals cannot by one course of vermifuges be divested of the larvæ in the cysts and blood vessels, they should be treated at intervals of two or three months. More important than medication is the exclusion of embryos from food and water.

Wherever the *Sclerostoma* have secured a local habitat the land should be put under a rotation of crops, to be laid down in grass again after four or five years. The *Sclerostoma* ova will by this time have hatched out and died a natural death. Where this is impracticable, change the horses to other pastures and depasture the infested land for several years by cattle or sheep, which do not harbour the *Sclerostoma*. In all cases it must be provided that no drainage can come from infested pastures to the clean pastures. Rock salt left in the paddocks for the horses to lick will greatly minimise the chances of infestation.

Pastoral.

THE NODULE PARASITE AND ALLIED WORMS FROM QUEENSLAND CATTLE.

BY PROFESSOR T. HARVEY JOHNSTON, University, Brisbane.

In the ''Queensland Agricultural Journal'' of December, 1911, the writer gave a brief account of the ''worm nodule disease'' (*Onchocerciasis*) of Queensland cattle. At that time it was not known that in addition to the parasite, *Onchocerca gibsoni*, Cleland and Johnston, which causes that condition, there were other allied worms infesting our stock. Last year attention was called by M. J. Bancroft and the writer to a second species, which was then identified as *O. bovis*, Piettre, but which is now regarded as belonging to *O. gutturosa*, Neumann. A third species, *O. lienalis*, Stiles, is reported for the first time as a common parasite of Queensland cattle. Of these, the firstnamed is of very great economic importance; the second of very little; and the third, probably none.

I. ONCHOCERCA GIBSONI, Cleland and Johnston.

The worm nodule parasite has caused very heavy loss to the Queensland meat export trade. Official figures supplied by the Commonwealth authorities (*see* Bulletin No. 2, Institute of Science and Industry, 1917) regarding the number of briskets examined during 1914, 1915, and 1916 in Queensland coastal meatworks show that about 80 per cent. were infected with nodules in North Queensland, 63 per cent. in Central Queensland works, and 70 per cent. (1914, 1915) in south-eastern meatworks. The number of cattle killed in this State during the period averaged about half a million head annually. The actual loss per average carcase of 650 lb. dressed weight intended for export was estimated during 1916 to be about 19s., as about 15 per cent. of the carcase, on an average, had to be removed, owing to its infected condition, before export was permitted by the Commonwealth authorities. Though the part so removed was utilised in other ways, yet the cost of removal and the diminished value of the excised portion involved a loss averaging nearly £1 for each carcase. The worm nodule parasite, then, must have cost Queensland nearly half a million sterling annually during the period referred to. It is only by quoting such figures that the public can be made to realise what a great loss has occurred, and is still occurring, to one of the great primary industries of this State. It is certainly surprising that, apart from certain investigations carried out several years ago at the Townsville Tropical Institute by Drs. Breinl and Nicoll, and those conducted by myself and staff in the University, Brisbane, practically no research relating to this important subject has been attempted in this State. The Commonwealth Government has subsidised in a small way some work carried out in New South Wales and Northern Territory. The earlier work of Dr. Cleland and the writer (1909-1911) was performed whilst in the service of the New South Wales Government. There is urgent need for the State authorities to undertake work, seeing that Queensland is the country most concerned in the problem. Such research work should be paid for by the community, and should be carried out by special research workers, properly qualified, controlled either by the Department of Agriculture or else, preferably for the independence of the researches, at the University.

The nodules, which occur especially in the brisket and stifle joint, vary somewhat in shape and size, but are generally of rounded outline, often flattened on two sides, and measuring from less than an inch to as much as four inches in their greatest length. Near the centre of each ''worm nest'' there lies a long, closely coiled female worm, 20 to 56 inches in length, with which there may be associated one or more small males, $1\frac{1}{2}$ to 2 inches long. The surrounding mass of fibrous tissue, which constitutes the bulk of the nodule, is really a reaction on the part of the adjacent tissues of the host against the presence of the parasite. Ultimately the latter dies, disintegrates, and undergoes calcification, but the nodule remains.

The female worm has its exterior ornamented by the presence of cuticular ridges wound spirally round the body. The degree of prominence and the closeness of these ridges to one another vary in the different parts of the body, but are fairly constant on the thickest part, the midregion of the worm. They differ, however, in the different species of *Onchocerca* and are used as a means for differentiating these parasites of

connective tissue, which are known to infest bovines, the camel, horse, and man. Sometimes the parasite shows a preference for a particular situation in its host animal, *e.g.*, one species invades the tendons of the horse's foot, while another parasitises the neck ligament, whereas in cattle one is especially common in the brisket (*O. gibsoni, O. indica*), another in the neck ligaments and certain other situations (*O. gutturosa*), another in various joints (*O. bovis*), another in the vicinity of the spleen (*O. lienalis*), and another in the aortic walls (*O. armillata*); a related worm, *Elæophora poeli*, belonging to the *Onchocercinæ*, also occurs in this situation, the last-mentioned two occurring in South-eastern Asia and adjacent islands. In all cases the *Onchocerca* parasites invade connective tissue.

The most important matter from the economic standpoint is the prevention of infection. But this presupposes a knowledge of the life history of the worm before it enters the ox. In other words, by what means is the parasite transmitted from ox to ox? How does it enter the bovine? Is it carried by some kind of blood-sucking insect, such as a mosquito, midge, louse, march fly (*Tabanid*) or other biting fly, or by a tick, *e.g.*, one of the cattle ticks (*Boophilus australis, Rhipicephalus sanguineus*); or is it transmitted by some aquatic organism? It is not likely to be transferred directly from ox to ox without the assistance of some intermediary. Though a great deal of experimental work has been carried out in New South Wales, Northern Territory, and this State, all results have as yet been negative. It can be safely stated that so far we have no knowledge as to what kind of organism acts as the necessary transmitting agent; and until that is known, one cannot hope to formulate successful measures for the protection of stock against this extremely common worm parasite. In the case of a related filarial worm (*Filaria bancrofti*) which very frequently infests human beings in Brisbane, it is known that certain mosquitoes which breed in abundance in the surrounding districts can readily act as transmitters; in fact, such insects are necessary agents, as infection would not occur without their help, since certain early stages in the life history of the parasite must be passed through within the mosquito, the early larvæ of the worm gaining access to the mosquito when the latter sucks up infected human blood, the fully developed larvæ invading the human body at a later date when the mosquito again feeds on human blood. Hence the disease human filariasis (including elephantiasis) can be controlled (1) by enforcing efficient measures for the destruction of mosquitoes, especially during the larval stage, when they may be most readily and effectively attacked and destroyed; and (2) by preventing mosquitoes from gaining access to infected patients (especially at dusk or evening), and thus becoming potential sources of infection to other people after the period necessary for the development of the worm-larvæ within the mosquito has elapsed.

These remarks should emphasise the importance of having research work carried out, having in view the discovery of the transmitting agent or agents of cattle *Onchocerciasis*, such work to be followed up, if necessary, by a study of the biology of the transmitters in order to ascertain the most advantageous time to attempt to control it, and thus indirectly control the spread of *Onchocerca gibsoni*. This parasite is not restricted to Australia; but occurs in the East Indies and South-eastern Asia also, while a closely related worm (*O. indica*) is found in cattle in India.

II. Onchocerca gutturosa, Neumann.

The second species, present in cattle in New South Wales and especially in Queensland, is now determined as *O. gutturosa*. A related, or perhaps identical, species infests cattle in the Argentine Republic and Uruguay (where it is called *O. bovis*), and in the United States of America. The parasite was originally described as occurring commonly in the neck ligament of cattle in Northern Africa (Algeria, Tunisia). In Australian bovines it is to be found in the ligament in the region between the first and fifth dorsal vertebrae as well as in the vicinity of the trochanter, and at times the stifle joint also. Though so common in this State (probably 50 per cent. or more of cattle killed at abattoirs being infected), its presence was not recorded until last year, when M. J. Bancroft and the writer reported it.

The lesions caused by this worm are much less obvious than those set up by *O. gibsoni*. Nodule formation is either absent or much less obvious, though a certain amount of fibrosis takes place. The female worms are much less intricately coiled, considerably thinner, and with ridges less prominent and much further apart than in the former species. Between the spiral ridges there are about four striæ, whereas in *O. gibsoni* there are only two. The distance between ridges in the midregion of the body is about one third to two-fifths of the midbody diameter, whereas in the former species it is from one-tenth to one-eighth. The male of *O. gutturosa* is rather smaller.

Degeneration and calcification occur after the death of the worms. Owing to the sites of infection and the usually comparatively small lesions caused, this species has little economic importance.

III. Onchocerca lienalis, Stiles.

This third species infesting Queensland cattle is to be found in the gastro-splenic ligament, close to the spleen, where the female worm appears as a long whitish thread enclosed in a delicate tunnel of connective tissue, the whole so resembling a nerve or empty blood vessel at first sight that its presence has been completely overlooked until now, this constituting the first record of its presence outside the United States, as far as the writer is aware. It is very commonly met with in Brisbane abattoirs as well as elsewhere in the State.

A specimen measured in Brisbane reached 17 inches in length, but its maximum breadth was only one-hundredth of an inch. This species possesses very low cuticular ridges, situated rather close together, their distance from each other in the midbody of a female being equal to about one-fifth of the maximum body diameter. There are two striæ between adjacent spirals.

O. lienalis appears to have no economic significance in regard to meat inspection.

It is reasonable to expect that similar agents, not necessarily specifically identical, will be found to act as transmitters of these three species of *Onchocerca*, whose common and widespread occurrence suggests that the transmitting agents must also be very common and widespread.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of July in the Agricultural Districts, together with Total Rainfalls during July, 1921 and 1920, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1921.	July, 1920.
North Coast.	In.		In.	In.
Atherton	0·88	20	1·24	1·04
Cairns	1·61	39	1·64	2·32
Cardwell	1·44	49	2·49	3·25
Cooktown	1·00	45	1·19	1·31
Herberton	0·64	34	2·40	0·88
Ingham	1·57	29	3·64	3·81
Innisfail	4·71	40	7·33	7·89
Mossman	1·57	13	1·28	3·68
Townsville	0·52	50	3·45	0·27
Central Coast.				
Ayr	0·53	34	5·68	0·42
Bowen	0·91	50	2·77	1·17
Charters Towers ...	0·53	39	2·85	0·37
Mackay	1·59	50	7·19	0·93
Proserpine	1·04	18	8·08	1·44
St. Lawrence ...	1·20	50	4·45	0·80
South Coast.				
Biggenden	1·25	22	2·62	1·59
Bundaberg	1·89	38	2·88	1·87
Brisbane	2·28	70	6·14	2·19
Childers	1·59	26	3·93	1·49
Crohamhurst ...	2·43	26	7·85	2·60
Esk	1·93	34	4·24	3·76
Gayndah	1·47	50	2·78	1·18
Gympie	2·11	51	5·40	1·97
Glasshouse M'tains	2·08	13	6·62	2·47
Kilkivan	1·69	42	2·22	1·32
Maryborough ...	1·93	50	3·46	1·58

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1921.	July, 1920.
South Coast—continued:	In.		In.	In.
Nambour	2·56	25	6·66	2·72
Nanango	1·72	39	3·52	3·13
Rockhampton ...	1·37	34	5·81	0·83
Woodford	2·43	34	5·37	1·99
Darling Downs.				
Dalby	1·79	51	3·30	3·36
Emu Vale	1·44	25	5·77	3·45
Jimbour	1·70	33	2·04	3·46
Miles	1·79	36	2·25	3·67
Stanthorpe ...	1·93	48	8·07	3·11
Toowoomba ...	2·00	49	5·33	4·03
Warwick	1·77	34	6·32	3·73
Maranoa.				
Roma	1·41	47	6·88	3·24
State Farms, &c.				
Bungeworgorai ...	1·14	7	7·05	3·03
Gatton College ...	1·31	22	4·12	2·55
Gindie	1·06	22	2·85	1·23
Hermitage ...	1·50	15	6·37	4·07
Kairi	1·10	7	...	1·78
Sugar Experiment Station, Mackay	1·28	24	6·97	0·82
Warren	0·68	7	5·42	0·91

Note.—The averages have been compiled from official data during the periods indicated; but the totals for July this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

The Horse.

CERTIFICATES OF SOUNDNESS.

List of Stallions registered and certified as sound, in the course of the month of July :—

Name of Horse.	Owner.	Address.
	DRAUGHT HORSES.	
Donald Crystal (L) ..	L. E. Walker	Brisbane
Prince of Invermay ..	G. Elliott	Laidley South
	BLOOD HORSES.	
Roseacre (L)	Wilson and McDouall ..	Calliope, Gladstone
Hopost (L)	W. Hayes	Mount Stanley, Linville, Esk
Had-I-Wist (L).. ..	L. E. Walker	Brisbane
	TROTTERS.	
Fred Cahill (L).. ..	Nurse Walsh	Earl street, Normanby, Brisbane
Rexie	E. Tuke	Rocklea
Dexter	F. Noffke..	Glenore Grove, Forest Hill
Little King Cole ..	S. Morris	Ottaba, *viâ* Esk
Cole King	T. K. Fitzgerald.. ..	Samford
	PONIES.	
Laddie (L)	S. C. Dahlin	Doggett street, Valley, Brisbane
Young Wiltrim (L) ..	W. Mewett	Kilcoy

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR JULY, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Bellona	Ayrshire ...	26 June, 1921	1,423	3·6	56·83	
Prim	Holstein ...	9 Mar. ,,	1,251	3·6	50·00	
College Cold Iron	Jersey ...	10 Mar. ,,	889	4·6	46·01	
Wattle Blossom ...	Guernsey ...	24 May ,,	662	5·4	42·42	
Hedges Nattie ...	Holstein ...	26 Feb. ,,	992	3·6	39·84	
College Mignon ...	Jersey ...	7 July ,,	605	4·5	30·50	
Miss Betty ...	,, ...	7 ,, ,,	613	4·4	30·25	
Charming Damsel	Ayrshire ...	12 May ,,	659	3·8	27·92	
Iron Plate	Jersey ...	12 July ,,	530	4·6	27·43	
Lilia	Ayrshire ...	3 April ,,	620	3·9	26·98	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	436	5·1	26·68	
College Evening Glow	,, ...	10 Nov. ,,	352	6·2	26·18	
Rosine	Ayrshire ...	19 Jan., 1921	603	3·6	24·09	
Miss Fearless ...	,, ...	21 May ,,	637	3·4	25·08	
Hedges Dutchmaid	Holstein ...	26 May ,,	660	3·3	24·06	
Leda's Jessie ...	Jersey ...	14 Jan. ,,	289	6·8	23·55	
Thornton Fairetta	,, ...	15 Mar. ,,	348	5·6	23·38	
Confidante ...	Ayrshire ...	12 May ,,	481	4·1	22·27	
Royal Mistress ...	,, ...	19 Mar. ,,	570	3·5	22·12	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	351	5·3	21·65	
Confidence... ...	Ayrshire ...	8 Feb., 1921	513	3·8	21·62	
Comedienne ...	Jersey ...	26 Nov., 1920	425	4·4	20·98	
College Cobalt ...	,, ...	6 Jan., 1921	411	4·5	20·73	
College Grandeur	,, ...	29 Dec., 1920	403	4·6	20·72	
Gatton Empire Lass	Guernsey ...	3 May, 1921	427	4·2	20·12	

NOTE.—Only cows producing 20 lb. of butter, or over, for the month are included in this list. The rainfall at the College for the month of July totalled 412 points.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JULY, 1921.

In spite of the unseasonable weather conditions, the production for the month was satisfactory. There were odd cases of moulting, but very little trouble was caused by broodiness, and the health of the birds generally has been good. R. Gill's group of White Leghorns made top score for the month in the light section with 141 eggs. In the heavy breeds W. Becker's group pen of Langshans laid the largest number of eggs with 151 to their credit. The groups generally have been more settled during the month. This can, in a great measure, be attributed to the shelter caused by the continuous housing, the backs being solid for a distance of 120 feet. A plentiful supply of green feed has been available. The following are the individual records:—

Competitors.	Breed.	July.	Total.
	LIGHT BREEDS.		
R. Gill	White Leghorns	141	490
H. C. Thomas	Do.	129	476
F. Birchall	Do.	122	465
*W. and G. W. Hindes	Do.	133	460
*J. M. Manson	Do.	139	454
*G. Trapp	Do.	100	447
Oakleigh Poultry Farm	Do.	132	445
*Mrs. R. Hodge	Do.	127	429
*C. M. Pickering	Do.	121	427
*H. Fraser	Do.	116	425
R. C. Cole	Do.	127	422
*J. W. Newton	Do.	122	418
*H. C. Towers	Do.	113	416
W. A. Wilson	Do.	107	401
*T. Fanning	Do.	119	380
*W. Becker	Do.	112	374
*Chris. Goos	Do.	117	372
*E. Chester	Do.	121	372
Bathurst Poultry Farm	Do.	111	369
W. Barron	Do.	113	366
*R. C. J. Turner	Do.	110	363
H. Stacey	Do.	131	360
O. C. Goos	Do.	81	359
Mrs. E. White	Do.	106	359
M. F. Newberry	Do.	113	355

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	July.	Total.
LIGHT BREEDS—*continued.*			
E. Stephenson	White Leghorns... ...	112	355
Mrs. E. Z. Cutcliffe	Do.	120	351
*Thos. Taylor	Do.	117	350
J. W. Short	Do.	94	347
*Thos. Eyre	Do.	123	345
*B. Chester	Do.	121	334
*Mrs. L. Anderson	Do.	111	334
*S. L. Grenier	Do.	104	329
*S. Williams	Do.	109	325
*Haden Poultry Farm	Do.	100	322
*W. and G. W. Hindes	Brown Leghorns... ...	103	312
*E. A. Smith	White Leghorns ...	86	311
Linquenda Poultry Farm	Do.	108	303
W. M. Glover	Do.	110	288
*H. P. Clarke	Do.	115	277
Brampton Poultry Farm	Do.	95	257
HEAVY BREEDS.			
Jas. Potter	Black Orpingtons ...	117	523
T. Fanning	Do.	132	509
*J. Ferguson	Chinese Langshans ...	134	465
*T. Hindley	Black Orpingtons ...	124	459
Rev. A. McAllister	Do.	133	454
*A. E. Walters	Do.	131	442
Jas. Every	Langshans	120	440
Jas. Ryan	Rhode Island Reds ...	139	436
G. Muir	Black Orpingtons ..	127	426
*R. Burns	Do.	147	424
*C. C. Dennis	Do.	141	412
*Parisian Poultry Farm	Do.	146	409
W. Becker	Langshans	151	403
*E. F. Dennis	Black Orpingtons ...	134	395
*R. Holmes	Do. ...	129	393
*E. Stephenson	Do.	107	375
*E. Morris	Do.	135	372
*J. Cornwell	Do.	129	368
G. Cumming	Do.	122	348
*H. Chaille	Do.	105	335
*Mrs. G. Kettle	Do. ...	110	310
J. W. Newton	Do.	114	297
*N. A. Singer	Do.	132	293
*A. Shanks	Do. ..	120	292
*J. E. Smith	Do.	140	284
*E. Oakes	Do.	102	235
F. H. Harrington	Do.	121	211
T. C. Hart	Do.	93	185
Total	...	8,226	25,839

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
W. and G. W. Hindes	88	64	78	90	86	54	460
J. M. Manson	68	83	83	68	85	67	454
Geo. Trapp	73	68	72	73	79	82	447
Mrs. R. Hodge	66	84	81	73	83	42	429
C. M. Pickering	81	74	64	62	85	61	427
H. Fraser	80	65	75	61	76	68	425
J. W. Newton	72	81	78	59	72	56	418
H. C. Towers	77	59	72	50	72	86	416
T. Fanning	73	59	64	61	55	68	380
W. Becker	71	79	52	57	92	23	374
Chris. Goos	67	83	28	40	52	102	372
E. Chester	63	68	61	61	58	61	372
R. C. J. Turner	67	57	54	48	67	70	363
Thos. Taylor	52	69	58	39	50	82	350
Thos. Eyre	52	54	46	59	69	65	345
B. Chester	49	49	74	50	70	42	354
Mrs. L. Anderson	47	65	60	59	63	40	334
S. L. Grenier	57	77	32	59	56	48	329
G. Williams	91	61	32	43	48	50	325
Haden Poultry Farm	52	44	50	56	52	68	322
W. and G. W. Hindes	42	38	33	74	50	75	312
E. A. Smith	80	53	53	48	45	32	311
H. P. Clarke	79	36	46	26	42	48	277
HEAVY BREEDS.							
J. Ferguson	83	67	66	86	80	83	465
T. Hindley	95	72	77	66	79	70	459
A. E. Walters	76	82	68	78	61	77	442
R. Burns	34	57	99	50	91	93	424
C. C. Dennis	80	67	50	76	69	70	412
Parisian Poultry Farm	66	66	66	95	38	78	409
E. F. Dennis	46	75	62	64	63	85	395
R. Holmes	56	57	62	74	91	53	393
E. Stephenson	72	59	65	59	51	69	375
E. Morris	57	73	32	83	62	65	372
J. Cornwell	61	38	66	75	65	63	368
H. Chaille	38	68	54	81	66	28	335
Mrs. G. Kettle	49	68	77	25	33	58	310
N. A. Singer	47	37	49	52	38	70	293
A. Shanks	22	51	39	57	62	61	292
J. E. Smith	78	76	51	38	25	16	284
E. Oakes	8	59	42	65	37	24	235

CUTHBERT POTTS,
Principal.

The Orchard.

NOTES ON THE MANURING OF PINEAPPLES.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In spite of the advice that has been given by the Agricultural Department for many years respecting the manuring of pineapples, many growers still fail to realise that the pineapple plant requires special manurial treatment which will provide an ample supply of the essential plant foods in a form that will enable it to utilise them to the best advantage.

Experience has taught us that the success of pineapple culture does not depend so much on the richness of the soil as on its being in a good mechanical condition and possessing good natural drainage. Such a soil is naturally warm, and if the situation is suitable is not likely to be subject to frost. The good mechanical condition of the soil encourages root formation, and if the soil has been well prepared, deep rooting; so that the feeding roots of the plant have a much larger area from which to obtain their supply of food than is the case when the majority of their feeding roots are near the surface.

Such a soil responds readily to the application of manure; consequently it is of the greatest importance to make sure that the manures applied to develop the pineapple crop are applied in the right form and that they contain their plant foods in the proper proportions required by the plant. Manuring carried out on any other lines is simply a waste of money, as it is no use to apply a manure containing an excess of one plant food and a deficiency of others. A manure containing an excess of any particular plant food is not an economical one to use, especially where there is an excess of phosphoric acid, as the excess of this plant food cannot be made use of, and as a result it is either washed out of the soil by heavy rain or, unless there is an excess of lime present, it forms insoluble salts of iron and alumina which remain in the soil in an unavailable condition.

The great fault with the majority of commercial fertilisers with respect to their suitability as a manure for pineapples is that they contain a large excess of phosphoric acid that is not required by the plant and which is out of all proportion to the amount of its potash and nitrogen contents. As a result, such manures are bad buying on the part of growers as, on account of their badly balanced composition, they cannot be made use of by the pineapple plant to the best advantage, and the grower has thus paid for a quantity of plant food from which he will obtain no benefit.

Many commercial fertilisers, in addition to having a badly balanced ratio of plant foods as regards pineapples, also contain these plant foods in the wrong form.

The pineapple plant is very sensitive to any excess of acidity in the soil, and any such soils must have their acidity neutralised by the application of lime before they are fit to grow pineapples; consequently the addition of acid phosphates, such as are contained in a commercial fertiliser in the form of superphosphate, only tend to increase the acidity in the soil and render it less suitable for pineapple culture.

Commercial fertilisers containing superphosphate should therefore always be avoided as a manure for pineapples, and growers should be careful not to purchase any fertiliser in which the phosphoric acid is said to be water soluble on the tag attached to the bag or on the invoice. Phosphoric acid should be in the citrate soluble form, such as occurs in bones, meatworks manure, finely ground island phosphates rich in carbonate of lime, basic slag, or basic superphosphate, or it can be present in a less soluble form which will become slowly available. Growers should therefore see that the phosphoric acid as stated on the tag or invoice is citrate soluble or insoluble, the larger proportion being citrate soluble.

The potash contained in the fertiliser should be in the form of sulphate, if procurable, as experience has shown that in this form its use has proved very beneficial; at the same time, the use of the muriate or chloride has so far shown no ill-effects.

The nitrogen contained in dried blood, bone dust, or meatworks manure has given very good results, and when procurable dried blood is probably the best form in which to apply this plant food. The price is, however, very high, and sulphate of ammonia has, therefore, taken its place in the majority of complete commercial

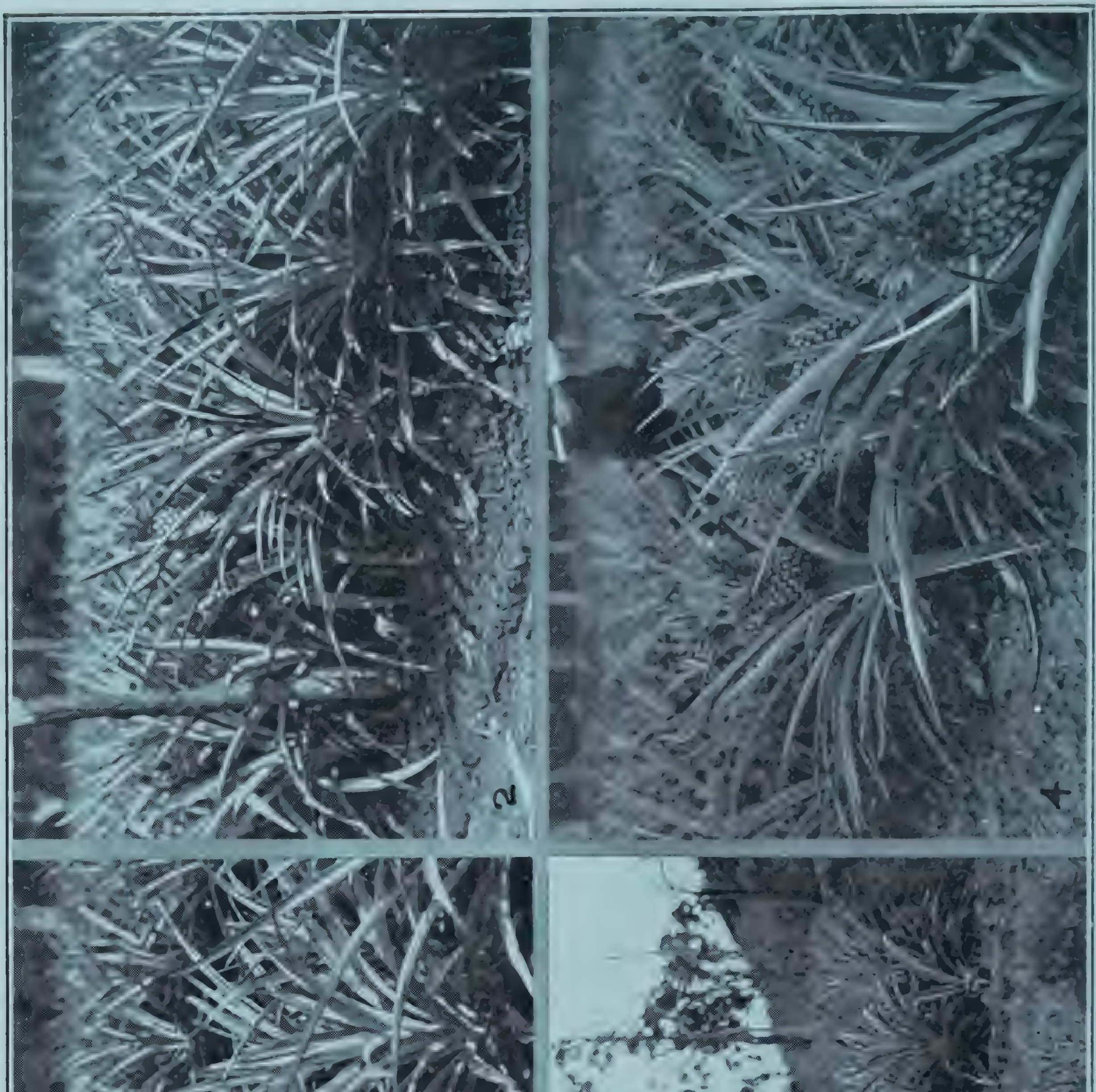

Photo. Dept. Agriculture and Stock.]

PLATE 31.—PINEAPPLE MANURING AT BEERBURRUM SOLDIER SETTLEMENT.

fertilisers, and, when used in the right proportion, has given good results. Nitrate of soda is also a good form in which to apply nitrogen, but from my experience it is better to apply this manure as a top dressing by itself rather than to use it as a component part of a complete fertiliser. The growing of a green crop for the purpose of providing a supply of nitrogen must be watched very carefully, as there is always the danger of rendering the soil acid by turning in large quantities of green material which generates acidity during the process of decomposition. Should this take place, the addition of lime to the soil will soon correct the acidity.

Many manurial experiments were carried out by the Department some years ago on pineapples growing on different classes of soils in the Brisbane District, and the result of those experiments is contained in the advice I have just given and the correctness of which has again been proved by a number of manurial experiments that have been carried out at Beerburrum, both on the State farm and on soldiers' holdings, where it has been shown conclusively that the majority of commercial fertilisers contain far too great a proportion of phosphoric acid in comparison with their potash and nitrogen contents, and, further, that the application of phosphoric acid in the form of superphosphates or water soluble phosphoric acid is distinctly injurious to the pineapple plant and is the cause of "spiking," viz., the production of narrow leaves indicating the weakened vitality of the plant.

A complete manure in use at Beerburrum, which has given very good results, contains approximately 4 per cent. of phosphoric acid, citrate soluble, 14 per cent. of potash in the form of sulphate, and 7½ per cent. of nitrogen in the form of dried blood, and this mixture is applied at the rate of 750 lb. to the acre during the months of August, September, and February. If these figures are compared with those of any complete commercial fertiliser on the market, it will be seen how small an amount of phosphoric acid is used as compared with that contained in the commercial article, and what a large amount of nitrogen and potash is present. This shows conclusively that growers are wasting money by applying an excess of phosphoric acid to their pineapple crops, and that the money so spent would have been much more profitably invested in the purchase of the nitrogen and potash that their crops needed.

The results obtained at Beerburrum bear out, as already mentioned, those obtained by this Department some years ago; and, further, they are in accord with the requirements of the pineapple plant and fruit as shown by chemcial analyses. A careful perusal of these analyses discloses the fact that the pineapple plant and fruit require twice as much nitrogen and more than twice as much potash as they do of phosphoric acid.

Growers will therefore see that it will pay them to apply the right manure to their pineapple crop, and that they only waste money by purchasing manures containing an excess of a plant food which this crop is unable to make use of.

HAND-REARING OF CALVES.

Hand rearing is adopted by most dairymen in order to procure the best monetary returns, but frequently the calf is the sufferer. A young animal requires natural food for the first few months; consequently, it cannot be expected to thrive and and keep in good health when it is fed on separated milk, practically devoid of fat, and frequently more or less contaminated with dirt and its accompanying organisms.

It is most important, for the first two or three days after birth, to give the calf its mother's milk (colostrum). This acts as a natural laxative, which is essential to clear the bowels of fœtal deposits (meconium). Following the first few days the calf should be given about 2 pints of new milk three or four times daily for at least four weeks, after which skim or separated milk can be given which is mixed with other foods, such as oatmeal or linseed gruel, the latter making up for the abstracted fat. Usually, when the calf is six weeks old it begins to pick grass or a little hay, but the skim milk and linseed should be continued until the calf is three or four months old, and always given at about the normal blood heat.

LINSEED JELLY.

Boil slowly for three or four hours, 1 lb. of linseed in 3 quarts of water, so that about 2 quarts of jelly or thick fluid remains. Mix about 4 oz. with the separated milk at each meal. Increase quantity as required.

OATMEAL GRUEL.

Mix 1 lb. of oatmeal in a gallon of cold water, and then boil; keep well stirred, then allow to simmer over a slow fire until it becomes thick. Allow 4 to 6 oz. with separated milk at each meal.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

SPATHODEA CAMPANULATA.

(Tropical West African Tulip Tree.)

NATURAL ORDER BIGNONIACEÆ.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(From ''Botanical Magazine,'' T. 5091, and ''Flora Tropical Africa,'' vol. 4, page 529.) This very beautiful flowering tree was first found and described by M. de Beauvois, a noted French botanist, who collected specimens at Oware, West Africa. It is common in many localities of Upper, South, Central, and Lower Guinea, such as Sierra Leone, Nigeria, Cameroons, French Congo, Lower Congo, Congo Free State, and many others.

Description.—A tree 20 to 50 ft. high, of erect habit, with freely branching top. Leaves opposite, from 12 to 18 in. long, swollen at base, pinnate, dark green, paler and somewhat silky beneath, particularly in young state, leaflets from 4 to 8 pairs, and single terminal one, ovate lanceolate, acute, quite entire, and penninerved.

Flowers, in short dense terminal racemes, corymbose, large, spreading, consisting of from 8 to 10 rather long and stout-pedicelled, very large showy flowers. Calyx like a spathe, 2½ in. long, splitting open on one side for the emission of the corolla. The corolla is about 4 in. long and the same in breadth, of a rich orange red colour, slightly paler within the tube; in form, broadly campanulate (bell shaped), yet curved upwards, the tube being suddenly contracted at the very base, where it is attached to the calyx. This gives the individual flowers a somewhat lop-sided appearance, sharply contrasting with the even form of the tulip, from which it takes its vernacular name. The tube is from 2 to 2½ in. in depth, stamens four included within the tube, spreading, one pair being a little taller than the other two. Anthers of two divergent, linear, oblong, dark brown linear cells opening longitudinally, ovary ovate.

Seed Capsule lanceolate oblong, from 6 to 10 in. long; valves keeled, seeds flat, about 1 in. in length and ½ in. broad. This includes the white hyaline wing that surrounds the dark brown seed, in appearance resembling very much that of *Jacaranda mimosæfolia,* the well-known Brazilian tree of the same natural order. A capsule that ripened in the Botanic Gardens contained a little over 1,000 seeds, but only about one-quarter were fertile.

Spathodea campanulata flowers from April until June, but spasmodic racemes of flowers are often borne out of the usual flowering season. A good specimen, near the George street entrance of the Gardens, when in flower always attracts the attention of visitors. There are three other flowering specimens in the Gardens, and a line of these beautiful trees, alternating with *Poinciana regia,* was planted last year along the river bank from the Domain to end of old line of bunya trees.

Propagation.—By seed. As the trees in the Botanic Gardens are now commencing to seed, this fine tree will soon be more often seen, and its brilliant orange-red flowers will enliven the landscape at rather a dull time of year. It would make an excellent street tree, but for the large flowers falling on hard pavements being likely to prove slippery and dangerous to pedestrians; still, as they are such striking and attractive flowers, passers-by would probably pick them up.

HORTICULTURAL NOTES.

This is a very good time to plant out palms, the cold weather being over, and they will have a chance of getting a hold of the ground before the heat of summer is in evidence. When planting, don't disturb the roots unduly; they are very averse to such treatment. Should the roots be in a dense mat, remember palms send out new roots from the stem that take up the running when the earlier root system of the plants has completed its work. Kinds to plant in warm localities.—*Phœnix rupicola* is a very beautiful palm for lawn specimens, as it does not grow too tall;

From coloured plate, "Botanical Magazine."]

PLATE 32.—TULIP TREE (*Spathodea campanulata*).

Oreodoxa regia (Royal Palm), and *Cocos plumosa* (Feather Palm). Of the latter a good type should be planted. Those of not too tall a nature should be used, and *Livistona chinensis* (Chinese Fan Palm) is also very ornamental. For cool districts the ''Cotton'' Palm (*Washingtonia filifera*) is very suitable, as it stands a fair amount of cold; also Cocos Yatay, the Brazilian Wine Palm.

Pot plants and bush-houses should now receive attention. Look over the former, and re-pot all needing attention, particularly ferns and palms. Don't overpot. Soil in pots not used or penetrated by roots is very apt to go sour. Wash clean all old pots, and soak new ones in water before using. Use a free compost of about equal parts of leaf mould, good loam, sharp sand, and old well-decayed cow manure. A little charcoal mixed through the compost is advantageous, particularly for ferns, gloxinias, and caladiums. For the two latter, both the manure and sand portions of the compost should be increased. When repotting, provide for good drainage; this is most important, and keep the plants well supplied with water afterwards.

In the flower garden, keep young aster plants growing freely. Remember that if they once get a severe check in growth, large plants and first-class flowers cannot be looked for. Plant our chrysanthemums. Old clumps are best brokn up. Select a nice strong portion, plant in a fresh place if possible, and throw out the remainder if not required. If not replanted, chrysanthemums degenerate quickly, and only sunflowers, and portulaca seeds. This latter is a useful, bright flowering plant, and may be grown during the summer on newly-planted rose beds to act as a protection of the surface from the hot sun of summer. Keep all newly-planted things watered, and stir the surface soil occasionally.

AN EASY WAY OF STARTING OIL ENGINES.

To every user of engines driven by crude oil the process of starting is a nightmare. The blow lamp, by means of which the fuel spray is usually given its initial heat, is a device with an almost satanic cussedness of behaviour. Moreover, its use involves a considerable amount of time as well as trouble. Consequently, there ought to be a wide welcome for an ingenious electric heater developed by a leading British firm of oil-engine makers. The device is extremely simple. It consists essentially of an electric heating element of high resistance wire placed in the line of action of the oil spray. A small amount of current suffices to make this wire white hot, in which condition it brings the spray rapidly to the temperature required for starting. After the engine has gone ahead the element is withdrawn, so that it is not exposed for more than a minute or so to the high temperature of the combustion chamber, an arrangement which gives it long life and great reliability. The electric current required for operating the heater is supplied by a 4-volt or a 6-volt battery charged from a tiny electric generator, driven through a bolt from the engine. By means of this device the engine can be quickly started up from the cold without the slightest trouble. Twelve months' trial of the apparatus has shown it to be thoroughly satisfactory.

HAND-REARING OF FOALS.

There is a great deal of trouble in hand rearing a foal. As is well known, the first milk any animal gives after parturition is known as ''colostrum,'' which is a natural purgative. Consequently, it is necessary, if a foal is hand fed from the time of its birth, something must be given as a substitute for this colostrum. The best milk for this purpose is that from a newly calved cow or heifer—a few days after calving. The milk of the one animal only should be used.

If the foal has not had the colostrum from its mother and appears constipated, give a small dose of castor oil—about two tablespoonfuls—and enemas of glycerine and water.

The chief difference between a mare's milk and cows' milk is that the latter has a larger proportion of casein and fat, and a deficiency of sugar; therefore, one must add sugar when cow's milk is used. At first give 1 part of water to 2 parts milk (half a pint every half-hour). A few weeks later give 1 part of water to 3 parts milk. When about two or three months old, give pure milk. Gradually increase the time between the meals as the foal gets older.

Milk should be given at the natural temperature, great cleanliness being observed in handling and diluting the milk.

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"In the course of the month the districts of Maryborough, Pialba, Yerra, Mount Bauple, and Nambour have been visited. An inspection was also made of districts between Gympie and Nambour.

"*Maryborough.*—The Maryborough district is at present in a promising condition in respect to sugar-cane culture. The areas planted are not extensive, but the cane is well grown, and at present the sugar content is fairly high. Farming operations are being impeded by the water that is on the ground. Preparations for spring planting are being pushed on, several farmers being engaged in the clearing and tillage of hitherto uncultivated soils.

"Not sufficient trouble is being caused by cane pests and noxious weed growth for comment, although gumming is evident in places. An inspection of the various canes showed that D.1135, 1900 seedling, and M.87 are probably doing better than any. There are no new features to comment upon.

"The soil needs lime and green manures. More care requires to be taken in selection of plants, and farmers should make the question of cultivating their young plant cane a more serious one, and not use heavy implements in the early processes.

"There are at present some good crops in the Pialba District. The heavy rain has given the soil a thorough soaking, and this, combined with economical bursts of warm sunshine, has caused the cane to make strong growth. Some of the plant standover cane ought to go 40 tons per acre, and the great bulk of the crop should average between 20 and 30 at the time of cutting. This does not include, however, cane practically killed by the drought. There is a small acreage in the latter condition that ought to be ploughed out as soon as the useful cane has been cut from it. So far, the growers have escaped frosts, but there is a likelihood that these may occur at any time, as the nights are fairly cold. Nothing serious in respect to insect or bacterial attack could be detected in the fields, and if farmers watch their planting operations carefully, the coming season should produce a fine crop of healthy cane. As previously mentioned, these lands want lime and green manures. Regarding varieties, D.1135 and 1900 Seedling are both making a fair showing. The former is the staple variety at Pialba. Such canes, however, as Q.813, E.K.1, E.K.28, and 100 Bont, all recently distributed from the Experiment Station, are making good growth, and are well worth looking after. Shahjahanpar No. 10 is also a cane lately brought from Bundaberg, and has struck fairly vigorously. It has a reputation as a frost resister and is worth watching. Satisfactory conditions prevail at Yerra. Most of the cane is vogorous, showing little signs of disease. Clearing of virgin land is in progress. Bad roads are still the greatest drawback. Farmers here, as well as in other districts, should remember that in the early months of the cane's growth it is absolutely essential to check weed growth and keep a good tilth on the soil. By careful observation of these principles they will increase their output very considerably. Weeds are greedy feeders, and rob the cane of much in this respect..

"*Mount Bauple.*—The growers at Mount Bauple are going to have a fairly good yield this crushing. In common with other areas, the good rains have pushed the crops ahead and given the ground a thorough soaking. Some of the plant standover crop looks especially well. Insect pests are well under control, with the exception of a borer attack in isolated patches.

"Some remarkably good crops are being produced at Bauple on the forest loams. These soils (*i.e.*, forest loams) have no great powers to sustain crop after crop, but they are prolific for a few years and then require green manure. The growers in this district, as a general rule, recognise the value of good tillage, and many are working and carrying on efficient ploughing and cultivating under very adverse conditions, particularly where the country is hilly.

"On the road between Gundiah and Bauple there is a considerable amount of cane growing in a healthy condition, and one farmer, Mr. Woods, in common with several others in this locality, will have some very good cane to cut.

"*Cooroy.*—An inspection was made of the land around Cooroy. Some farmers there have planted cane (variety D.1135 and H.Q.285) which looks well. These men ought to persevere, as conditions are suitable and they now have enough cane for plants. Cooroy is not ideal for canegrowing, but much of the land would grow this crop.

"*Yandina.*—While at Yandina a visit was made to Mr. Bowder's property. This gentleman has done some excellent development work in this locality, and has been repaid by a good crop. On a previous visit to this farm, nothing like the present crop was anticipated, and in some places it will go 35 and 40 tons per acre. The three varieties planted, D.1135, H.Q.285, and Q.813, all look well. A siding has been constructed at the instance of Mr. Bowder near the holding.

"*Nambour.*—Nambour district looks well at the present time. An inspection was made while here of the Maroochy River and Coolum areas. At the latter place several energetic men are busy draining big areas that are virtually swamp, but nevertheless very rich land. If the water is successfully taken off—and there is no reason why it should not be—then some big crops of cane should result. That cane will grow on the drier lands has been demonstrated also. Mr. White, a farmer in this locality, has a very fine plant crop of D.1135. There are also several other growers who have good plant crops to their credit.

"As yet, at least as far as the swamp is concerned, the matter hinges on the success of the farm engineering problems. Bigger and straighter drains than are at present in existence are necessary, thus reducing friction and increasing velocity, and the diverting of water that comes from other sources on to these areas is also essential. Coolum is a delightful place, admirably suited for banana and citrus fruit growing, and closer settlement generally.

"*Maroochy.*—The Maroochy River is going to yield some extra heavy crops of cane this year. Varieties such as N.G.16, H.Q.285, D.1135, and Malabar are all cropping heavily, especially the latter. One crop of this cane on Mr. Fahey's place will go close to 100 tons per acre. The average yield on the river this year ought to be from 35 to 40 tons per acre. A feature noted during the inspection was the absence of disease, although in places, on N.G.16, a fungoid parasite, indicated by a red rusty spot, is attacking the leaf. If this spreads, growers would do well to give this variety a rest. They can do so without hardship, as there are several other good growing canes to choose from.

"One or two old patches of cane here should be ploughed out. There is also an inclination to ratoon too often. Green manures as well as lime would increase the yield on some of the poorer soils. Practically all the farms inspected on these areas would benefit by the use of lime. Abnormal rains have fallen on the Maroochy River this year."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from Mr. E. H. Osborn, Northern Field Assistant:—

"*Bowen.*—A visit of inspection was paid to the Bowen area in the middle of July, and it was noticed that, considering the dry weather that had so lately been experienced, the crops were looking very well. The irrigated blocks, despite the dry weather, were looking fair, but where watering had been carried out some splendid cane may be seen.

"The rainfall to the end of June was 24.69 inches, and early in the following month a further 2.71 inches were registered. Before the latter fall the cane had started to go off considerably, but this welcome downpour freshened everything up. The principal varieties grown are the Gorus, N.G.24, 24B, Badila, D.1135, and H.Q.426 (Clark's Seedling). The two former canes are doing remarkably well, especially where irrigated, and some very heavy tonnages per acre will be harvested. D.1135 also looks well, but H.Q.426 did not appear to be doing so well where noticed. Not very much Badila was seen. As evidence of the remarkable fertility of the land at Mr. J. Maltby's farm, the following crops were growing:—Cane (looking splendid), maize, Indian corn, sorghum, buckwheat, oats, tares, lucerne, English and sweet potatoes, pumpkins, onions, eschalots, turnips, mangels, parsnips, horse radish, cabbage, cucumbers, beans, peas, rhubarb, egg fruit, strawberries, citrus fruits, and tomatoes. This shows what can be done by an up-to-date farmer aided by irrigation.

"The soil generally is stiff or sandy deep black and brown loam, and can certainly grow good crops of high density cane. Most of the farmers seen expressed

their intention of increasing their present cane areas, as they find that the Proserpine Mill is ready to take any cane that they can supply. Green manuring or liming has not so far been extensively gone in for, but is, I think, likely to become more popular, as a number of farmers expressed their views to that effect.

"*Proserpine.*—Proserpine was next visited. At this sugar centre the conditions were found to be quite the opposite to those ruling at Bowen, as up to the time of writing 81.88 inches of rain represented the rainfall from 1st January. This large rainfall has had the effect of seriously retarding all ploughing and planting operations.

"A very large acreage of ground had been ploughed several times, but planting, except in a few favoured parts, had not been possible. This was most noticeable on the Albert and Kelsey Creek land, planting there being in full swing whilst other less fortunate areas were idle.

"Now that the mill management has provided an extra length of portable line for the growers at this end, a larger area of the rich deep soil here is being planted for next season. There is still, however, a further area of really good land that ought to be growing cane. The general appearance of the crops in the vicinity of Albert and Kelsey Creeks is most promising. Some fine crops of 24B, H.Q.426, Badila, Q.813, 1900 Seedling, and D.1135 were noticed.

"Taking the Proserpine District as a whole, however, it is unlikely that the earlier estimates of tonnage to be crushed will be realised, as the constant wet and very little warmth has not been conducive to a good growth.

"The cane was also considerably knocked about by wind a couple of weeks ago, H.Q.426 suffering most severely from this cause.

"Among the varieties of cane grown locally, H.Q.426, Malagache, Green and Red Goru (24B and 24), Badila, Striped Singapore, D.1135, 1900 Seedling, and Q.813 were noticed. The latter cane has evidently come to stay, and seems to suit the district well. All the farmers here taken a keen interest in any new varieties, and their association is getting a large number of plants from the Mackay Experiment Station next month. The varieties asked for include Q.970 and Q.1121, among others. On various parts of the area some fine crops of 24B were noticed growing; 1900 Seedling was also looking well.

"This district has so far been fairly immune from pests, only light traces of grubs being noticed throughout the cane areas. In connection with grubs, it will be remembered that Mr. R. Redhead, of Strathdickie, suffered severely from them. He then planted corn, but this was also attacked by the pest.

"Subsequently, last year he again planted with cane (H.Q.426), using 80 lb. of 90 per cent. arsenic to the acre in the drills with the plants. This cane is now a fairly mature crop, looking beautifully green and healthy, without any sign of grubs.

"Borers were noticed in several parts of the district, H.Q.426 seeming to attract them more than any other variety. Too much care cannot be taken in using healthy plants in connection with this pest.

"Very little liming or green manuring has been carried out in this locality; the cost of the former has, to some extent, been the reason. With more liming and draining, better crops should certainly be grown.

"When the large area of idle land adjacent to the mill's tramlines is noticed, it raises the hope that the drainage scheme now spoken of will very soon be put into effect. This would enable some hundreds of acres of good quality land to be put under cultivation.

"The mill started crushing operations on the 28th ultimo."

SHAHJAHANPUR, No. 10.

A few years ago a variety of sugar-cane called Shahjahanpur, No. 10, was received by the Bureau of Sugar Experiment Stations from the Shahjahanpur Sugar Experiment Station, India, being recommended as a cane which would stand cold weather well. This cane was planted out at the Bundaberg station, where it was found to resist severe frosts remarkably well. Its sugar content and cropping qualities being good, it was ultimately distributed to a considerable extent in Southern Queensland. On a recent visit to Bundaberg, Mr. Easterby stated that his attention had been directed to a very fine block of this variety, about 12 acres in extent, which had been grown at Spring Hill by the Fairymead Sugar Company, under the charge of Mr. Axam. This cane was then only nine months old, but presented a splendid vigorous growth. Mr. Axam said that in his experience with the cane it had never been affected by frost, and this was borne out by Mr. Pringle, the chemist in charge of the Bundaberg Sugar Experiment Station. If this cane maintains its reputation, it should be extremely valuable to canegrowers who suffer

from frost. The last analysis of the cane made at the Bundaberg Station last year gave the following results:—

Brix	21.7	per cent.
Purity of juice	91.0	per cent.
Fibre in cane	13.6	per cent.
Commercial cane sugar	15.05	per cent.

The Fairymead Sugar Company have been of great assistance to the work of the Sugar Bureau in demonstrating this variety, and also Q.813, on large blocks of land.

BANANA POCKET AND THOMSON CREEK LANDS, NEAR PROSERPINE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from the Northern Field Assistant, Mr. E. H. Osborn, on the above lands and their suitability for cane-growing:—

"In accordance with your instructions, I beg to report that in company with Mr. E. G. Lascelles, I inspected the following areas:—Banana Pocket is situated 14 miles south from Proserpine, and about 5½ miles east from the proposed Thomson's Creek railway siding, on the Mackay extension of the Government line, and over fairly level country.

"The 'Pocket' lies between Thomson Creek and the O'Connell River (both tidal waters), which empty themselves into Repulse Bay. There are some 2,000 acres of freehold land there, of which about 1,500 acres, consisting of, say, 750 acres of scrub and 750 acres of forest, are very good. Adjoining this area is a Crown lands reserve of 555 acres, of which about 400 acres should be suitable for growing cane.

"There is also an additional area of fully 500 or 600 acres of Crown lands, but situated upon the northern side of the O'Connell River.

"In and about the Pocket the soil consists of a rich deep black porous alluvial loam, from 2 feet in depth and upwards, with an underneath soil of some 10 to 14 feet in depth of porous river silt. Underneath this again is water-worn small boulders or sand. In the scrub the soil is similar but lighter in colour. The forest country carries such timber as acacia, apple, Moreton Bay ash, and gums. The scrub, which is fairly thick, carries the usual scrub timbers and lawyer cane.

"On the freehold area twenty-nine farms have been cut up, each of them having about an equal amount of scrub and forest land. About nine families are now occupying farms, growing bananas, corn, sweet and English potatoes, and tobacco. Nearly all of them have small plots of cane, grown principally for pig feed, but also to show that cane can be grown here successfully. I am told that plenty of well water can be obtained at a depth of about 18 feet. The nearest rainfall figures that can be obtained are those from the Goorganga Homestead. The average rainfall from 1914 to 1920—not including 1916, of which the record has been lost—was 58 inches per annum. So far the fall for this year is 58 inches as against 81.68 inches to date at Proserpine.

"Flood waters get away very quickly and do very little damage, and owing to the porous nature of the soil very little water is left lying about. Frosts also are very slight; bananas continually growing on one block for five or six years bear this out.

"Upon the farms visited some splendid cane was noticed growing. It was all planted in October and November of last year, and included such varieties as H.Q.426 (Clarke's Seedling), Goru 24A and 24B, Striped Singapore, D.1135, Malagache, Badila, and 1900 Seedling. Taking into consideration the time of planting, all the cane looked well, the 24B, Badila, and 1900 Seedling particularly so. Some of the 1900 is very fine and growing true to type. In one place a stool of thirteen or fourteen months' old Badila gave from two plants over thirty thick and vigorous canes, with an average length of about 6 feet.

"None of the cane has had much attention paid to its cultivation, and one cannot but fail to be struck with its extremely healthy appearance and splendid growth. Upon another farm some stools of green Goru (24B) said to be fourth or fifth ratoons are now carrying sticks of 5 or 6 feet in length. I am told that this particular lot has practically grown wild, being eaten down several times by cattle and other animals, but still persists in growing, and gives a fair idea of the value of the soil.

"The farmers now settled here are living in the hope that the splendid cane-growing possibilities of this rich area will be recognised in the near future, as they are certain that if the country is once opened up by either tramway or railway communication, there would be no shortage of cane for the Proserpine Mill."

Photo. by W. Perroux.]

PLATE 33.—BANANA POCKET—BANANA FARM.

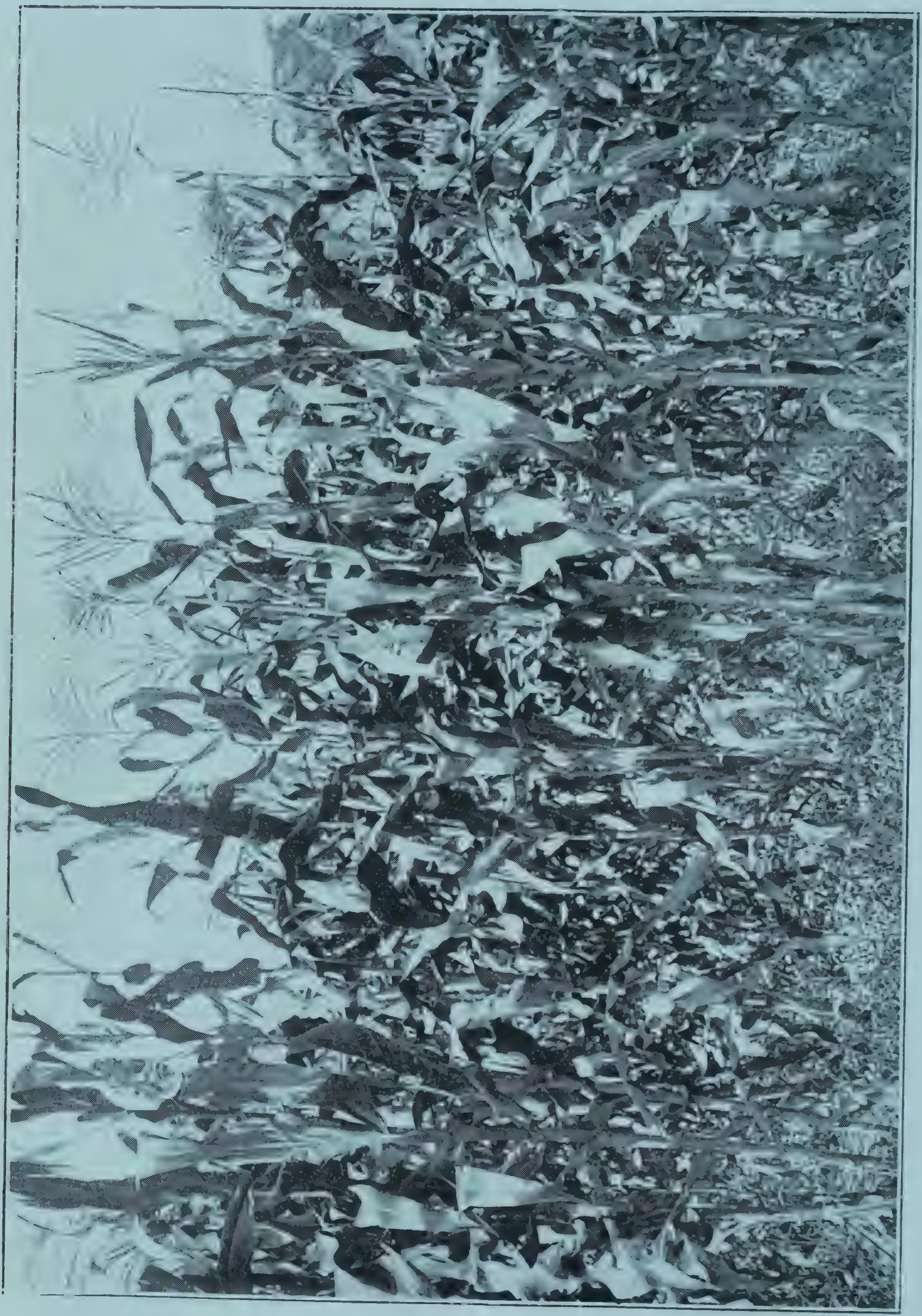

PLATE 34.—BANANA POCKET—CROP OF MAIZE.

Photo by W. Pennur.]

Photo. by W. Perroux.]

Plate 35.—Banana Pocket—Crop of Tobacco.

Photo. by W. Perroux.]

PLATE 36.—BANANA POCKET.—CROP OF TOBACCO.

Photo. by W. [illegible].]

Plate 37.—Banana Pocket—Tobacco Drying Shed.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

BY C. T. WHITE, F.L.S., Government Botanist.

No. 23.

SNAKE WEED (*Stachytarpheta dichotoma*).

Description.—An erect branching herb, 2 to 3 feet high. Stem and leaves smooth, not hairy. Leaves elliptical or somewhat obovate, gradually tapering at the base into a distinct leaf-stalk, 1 to 3 inches long, ½ to 1 inch broad, the margins toothed. Flowers in long terminal slender spikes of up to 15 inches in length. Individual flowers bright blue, about ½ inch across, the lower part more or less sunk in a depression in the rhachis of the spike. Fruit (''seeds'') enclosed in the calyx, consisting of two dark-brown narrow nutlets, 2 to 2½ inches long.

Distribution.—A native of tropical America now widely distributed as a naturalised alien in most tropical and subtropical countries. In Queensland it occurs practically along the whole of the coastal belt.

Common Names.—It is very abundant about Cooktown, and Mr. Pollock informs me that it is known there as ''Snake Weed'' in allusion to the long narrow spikes of flowers. J. C. Loudon in his ''Encyclopædia of Plants'' gives ''Bastard Vervain'' as a common English name.

Botanical Name.—*Stachytarpheta*, from the Greek *stachys,* an ear of corn, and *tarphetos,* thick, alluding to the flowers being closely packed in a long slender spike; *dichotoma* from the Greek *dichotomeo,* I cut in two, in allusion to the branches coming off in opposite pairs.

Properties.—No uses seem recorded for the plant. It is not known to be poisonous in any way, but seems to be left quite untouched by stock.

Eradication.—In small areas hand pulling or hoe cutting is the most effective method. In larger areas, where the plants are growing thickly together, spraying with a weed-killing solution should be successful.

Botanical Reference.—Stachytarpheta dichotoma, Vahl. Encyl. 1. p. 207 No. 5.

TWO PLANTS POISONOUS TO STOCK.

BY C. T. WHITE, F.L.S., Government Botanist.

Writing from Malanda, North Queensland, Mr. H. Jubt writes, under date 18th July, 1921, ''Please let me know the name of the bush of which I enclose a leaf of two. I might state that I tied two valuable heifer calves to this bush and after they had nibbled the leaves, one died and the other went blind; it seemed to paralyse their hind quarters.''

The bush of which Mr. Jubt sent a specimen is the Finger Cherry (*Rhodomyrtus macrocarpa*), the fruit of which contains a sapo-toxin and is well known and dreaded in North Queensland as being capable of causing blindness in people who may eat too freely of it. This is the first notice, however, that has come under my notice of the plant being suspected of causing trouble amongst live stock by their browsing on the foliage, and it would seem that the poisonous principle was contained more or less in all parts of the plant. Referred to the Agricultural Chemist (Mr. J. C. Brünnich), that officer reported—''The presence of poisonous saponins in the fruit has been proved and there is bound to be some of this substance in the leaves where all these bodies are formed.''

Writing from Toowoomba to the Chief Inspector of Stock, the local inspector (Mr. R. O'Bryen) states, under date 28th July, 1921, ''I enclose samples of a weed received from Mr. George H. Anderson, of Kingsthorpe, who blames it as the cause of the death of a horse of his which had eaten of it.''

From coloured illustration in Curtis's "Botanical Magazine."]

Plate 38.—Snake Weed (*Strachytarpeta dichoroma*).

The weed is the Henbit or Dead Nettle (*Lamium amplexicaule*), a common European and American weed naturalised in Australia but commoner in the southern States than in Queensland. It has been naturalised here for a number of years, but so far it has not asserted itself as a particularly aggressive species. Recent feeding experiments carried out in New South Wales and detailed by Dodd and Henry in the "Agricultural Gazette of New South Wales" for May, 1921, have shown the plant capable of producing staggers in stock. This is remarkable, as the weed is one that is common both in Europe and America and no cases are recorded against it in those countries.

It was also received last year from a farmer at Pratten (Mr. Chas. Baker) with the report that he suspected it of being poisonous. At that time, unfortunately, we knew nothing of the plant's bad qualities, and it is only within the last few months that its poisonous character has been proved.

Similar remarks apply to another very closely allied plant and a common weed in Queensland, viz., the Stagger Weed (*Stachys arvensis*). This weed in Australia is almost universally looked upon by stockowners as dangerous to working or travelling stock of any description, yet nothing of this character is heard about it in other parts of the world, though it is an abundant weed, practically speaking, over the whole of the temperate regions of the globe.

THE SASSAFRAS TREE.

Since the article that appeared in the July issue of the Journal dealing with the Yellow Sassafras (*Doryphora sassafras*) several settlers from the Atherton tableland have written stating that sassafras trees are common in the Northern scrubs, whereas the article in question states they do not occur north of Brisbane. The matter was referred to the Government Botanist, who states that the Northern sassafras trees, of which there are more than one kind, all belong to distinct species to the Southern one and that figured in the Journal, though the commonest belongs to the same family and is closely allied. The common Northern tree is *Daphanandra aromatica,* which differs from the *Doryphora* in leaves and floral structure.

POISONOUS "MILK WEED" (PRATIA ERECTA).

Mr. J. H. McCarthy, stock inspector, Beaudesert, reports:—

"A grazier on the Upper Albert River reported to me that he has been continually losing young sheep. I made a post-mortem examination of one for fly, stomach worms, and lung worms. Results negative. Stomach symptoms of poisoning were, however, strongly marked. An inspection of the farm, which is bare of grass, revealed the fact that the sheep were living almost entirely on 'milk weed' which, I have no doubt, caused the mortality in the flock. I have previously observed cases of this kind among young calves on a number of farms, death evidently being caused by eating milk weed. Young stock feeding over it for some days show no ill effects, but, later, symptoms of poisoning develop rapidly and death follows in about five or six hours. Pawing the ground and convulsions or 'fits' are marked symptoms."

A specimen of the weed forwarded by Mr. McCarthy was submitted to Mr. C. T. White, F.L.S., Government Botanist, who advises as follows:—

"The specimen sent is *Pratia erecta,* commonly known in many places as 'Milk Weed.' I have little doubt that the plant is poisonous, as reported by Inspector McCarthy, and I am much indebted to him for his remarks, which are interesting and worthy of being put on record."

Forestry.

QUEENSLAND TREES.

BY C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 6.

THE COONDOO (*Sideroxylon Richardi*).

Common Name.—The common name we have adopted is used in parts of the Wide Bay District and is applied to the tree because it is plentiful on Mount Coondoo. It is also known as "Sweet Bark" in allusion to its sweet astringent bark.

Derivation.—*Sideroxylon* from Greek *sideros,* iron; *xylon,* wood (alluding to the hard wood of some species); *Richardi,* after A. Richard.

Description.—A tree attaining 130 feet in height and a barrel diameter of about 3 feet. Barrel sometimes slightly flanged at the base. Bark brown, rather rough and somewhat scaly, shed in large irregular pieces; when cut, dark red and exuding a milky juice; measuring $\frac{3}{8}$ inch thick on a tree with a barrel diameter of 2 feet.

Young shoots and parts of the flowers covered with fine hairs. Branchlets fairly thick. Leaf stalks $\frac{3}{8}$ to 1 inch long. Leaves alternate, mostly crowded towards the ends of the branchlets, oval or elliptical, rounded, obtuse or occasionally drawn out into a point at the apex, especially in Northern specimens, midrib and sometimes the lateral nerves visible on the upper surface, but both are more prominent on the underside, where also numerous and fine net veins are often prominent; measurement of leaf blade, $2\frac{1}{2}$ to $5\frac{1}{2}$ inches long, twice to three times as long as broad. Flowers in clusters of 2 to 7 (seldom reduced to 1) in the forks of the leaves. Stalks of individual flowers $\frac{1}{5}$ to $\frac{1}{2}$ inch long. Each flower measures about $\frac{1}{5}$ inch long; the outer part, the calyx, consists of 5 broadly oval or nearly round lobes, which are sometimes finely hairy and measure about $\frac{1}{8}$ inch long; generally there are 3 outer lobes overlapping 2 inner ones. On the inside of the calyx is the corolla (the combined petals) which is broadly cylindrical or cup-shaped, measures about $\frac{1}{5}$ inch in length, and is divided to about the middle into 5 lobes. Stamens 5, included in the corolla, each stamen situated about or below the middle of each corolla lobe. Alternating with the stamens are 5 slender staminodia (undeveloped stamens). Ovary (in the centre of the flower) egg-shaped, often covered with very fine down, generally 5 or 4 celled, tapering into a hairless style about $\frac{1}{10}$ inch long. Fruit narrowly oval, black when ripe, surmounted by the short persistent style, about $\frac{3}{4}$ inch long, the outer fleshy part enclosing 1 or sometimes 2 seeds. Seeds narrowly oval, about $\frac{1}{2}$ inch long, the scar (hilum) narrow and more than half the length of the seed.

Distribution.—Scrubs of the coastal area of Queensland from the Tweed River in the South to the Barron River in the North. New South Wales, from Illawarra to the Tweed River. Confined to Australia.

Uses.—The timber should be useful for cabinet-making and general indoor work.

The late F. M. Bailey in his "Comprehensive Catalogue of Queensland Plants" quotes Dr. Jos. Lauterer to the effect that "The sweet astringent bark might be useful in throat diseases."

References.—*Sideroxylon Richardi,* F. von Mueller, in "Systematic Census of Australian Plants"; *Achras laurifolium,* F. v. Mueller, in Bentham's "Flora Australiensis," vol. IV., p. 282; *Sideroxylon laurifolium* (Rich.), Benth. and Hook. in Genera Plantarum IV., vol. 2, p. 665; F. M. Bailey in "Queensland Flora," part III., p. 955.

The name *laurifolium* had already been preoccupied in the genus for two extra-Australian species, and for this reason Mueller's name of *Sideroxylon Richardi* is adopted.

Photo. by W. D. Francis.]

PLATE 39.—THE COONDOO (*Sideroxylon laurifolium*), KIN KIN SCRUB.

Photo. Dept. Agriculture and Stock.]

PLATE 49.—THE COONDOO (*Sideroxylon laurifolium*): SHOWING LEAVES, FLOWERS, FRUIT AND SEED.

Entomology.

BANANA BEETLE BORER* INVESTIGATIONS.

[FIRST PROGRESS REPORT.]

BY JOHN L. FROGGATT, B.Sc., Entomologist in Charge of Banana Beetle Borer Investigations.

INTRODUCTORY.

The literature on the subject of the Banana Beetle Borer is not extensive and, in so far as systematic research work is dealt with, it is scanty. There is, therefore, very little subject-matter available to guide the investigator in deciding what should be included and what excluded when devising a systematic scheme of work.

The first matter for study must necessarily be the development, habits, &c., of the beetle, in order to ascertain any period, or periods, in its life cycle during which it is more vulnerable to natural enemies, or more readily subject to treatment, than during the remainder of its life cycle. This entails a very careful and close study of the insect, both in the laboratory and in the field. As the necessary laboratory facilities are not yet available, a considerable portion of the investigations has been either impracticable, or, if not, beset with difficulties.

The following account of the field and laboratory investigations, carried out from 1st January to 30th June, 1921, cannot be looked upon as exhaustive on any portion of the subject, but is rather in the nature of a Progress Report, intended to show what has been done and the results so far obtained.

THE EGG.

The egg has only been found on a few occasions in the field, being difficult to detect. In February, 1921, a single egg was found lying loose amongst the decaying leaf-bases at the crown of the corm of a living plant. In the same month a single egg was found deposited in a slight furrow in the side of a larval tunnel in an old corm lying on the ground. At the end of May, 1921, a number of eggs were found deposited in corm and old stems lying on the ground.

In the office, in April, 1921, two eggs were found in a small piece of corm on which beetles had been feeding in a tin; one was deposited in a small furrow in a slight indentation on the surface of the corm; the other was just below the surface. At the end of May and throughout June, 1921, a large number of eggs were obtained from pieces of corm on which beetles had been feeding in tins.

In every case so far noted the eggs have been laid singly and, where below the surface, in a slightly curved burrow only large enough to hold the egg, which is just beneath the surface.

From observations made on cut-stems lying in the plantations, it was found that the site for the deposition of the egg, in such cases, is usually within two feet of the cut end, and just beneath the surface. In cases where corm is attached to the stem, the site of deposition of the egg is apparently close to the crown of the corm.

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* Cosmopolites sordida, Chevr. (Curculionidæ).

From the eggs obtained, as stated above, a great deal of valuable information is being obtained. The first sign of the development of the larva within the egg is made manifest by the appearance of the jaws as fine brown lines; the period elapsing from the time of deposition to this stage of development was from thirteen to eighteen days, as noted during May and June, 1921. The period subsequently elapsing until the emergence of the first larva has been found to be from one to three days. The total period, however, from the deposition of the eggs to the emergence of the first larva was from seventeen to twenty-one days during the same two months.

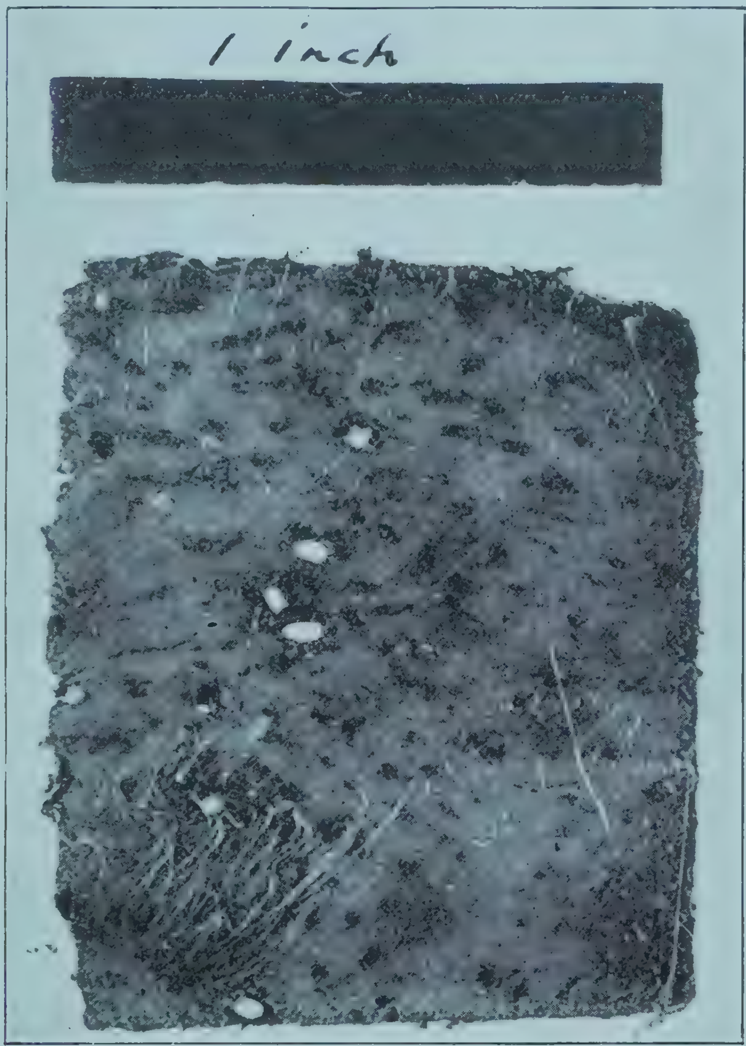

PLATE 41.—EGGS C. SORDIDUS IN SITU IN CORM.

It has been found difficult to breed from the egg after transference, owing to fungus growths developing in any incision made in the plant or piece of corm.

THE LARVA.

The larva, during the warmer portion of the year, has been found to take from three to four weeks to reach maturity. Larvæ collected in the field in April and May, 1921, being then in a well developed state, remained in the larval form for more than four weeks before pupating, after transference, in the office.

In the stools, the larvæ feed principally on the corm (or bulb) of the banana plant, although sometimes they are found to have tunnelled well up into the central core of the stem; this was more commonly

observed in the stems after removal of the bunch, when decay had begun to set in. When found infesting cut-stems, the central core was always found to be the principal, if not the only, area attacked by the larvæ.

The damage which a single larva can do is considerable. In one case the corm of a sucker of Lady's Finger banana, about two inches in diameter, was found to have had practically the whole of the centre eaten out by a single larva.

It is extremely difficult to arrive at a fair comparison between the amount of damage done and the degree of infestation, owing to the variation in habits shown by the larvæ, which sometimes have been found to remain in one area and eat that right out, whereas at other times they tunnel in all directions individually.

PUPA OR NYMPH.

From nymphs collected in the field, the beetles have been found to emerge in from two to seven days; the age of the nymphs, when collected, was unknown. The nymph from a larva maturing in corm in the office at the latter end of May, 1921, occupied fourteen days in reaching maturity.

The pupal chamber in the corms has been found always to be situated below ground level, close to the surface of the corm at the end of a larval tunnel. The position of the pupal chamber in relation to the axes of the corm varies: it is sometimes found parallel with the horizontal axis, sometimes slightly inclined to it.

In cut-stems the position of the pupal chamber varies considerably. Although it is generally just under the surface, it has been found as far as two inches in from the surface.

Occasionally a few strands of fibre are found in the open end of the pupal chamber; so far as has been observed, this is exceptional.

As the pupa approaches maturity it changes colour from a pale yellow through light brownish yellow to a light reddish brown, which is generally the colour of the beetle on emerging.

THE BEETLE OR IMAGO.

After emerging from the pupa, the beetle lies dormant in the pupal chamber for several days, by which time the tissues have hardened and the colour changed to a very deep reddish brown or even black. Immature imagos, removed from corms and cut-stems, have been found to lie dormant, when placed in tins with corm over earth, for from four to five days before showing any marked inclination to move or feed. In nearly all cases the beetles had developed their full (black) colour within seven days. The mortality amongst immature beetles transferred in this way is very high.

Notwithstanding that the beetles have large and well developed wings, the experiments so far carried out to test their power of locomotion in air have not demonstrated that they fly. Neither by any method so far tried has one been able to be made to fly.

Ordinary white light exercises a strong deterrent action on the beetles, which, upon exposure to it, crawl away into any dark place; if they be placed on soil and then so exposed to the light, they will work their way beneath the surface and remain there. A number of coloured lights are being tested, particularly to ascertain, if possible, if there be

PLATE 42.—WORK OF TWO LARVÆ OF C. SORDIDUS ON BANANA SUCKER.—EXTERIOR VIEW.

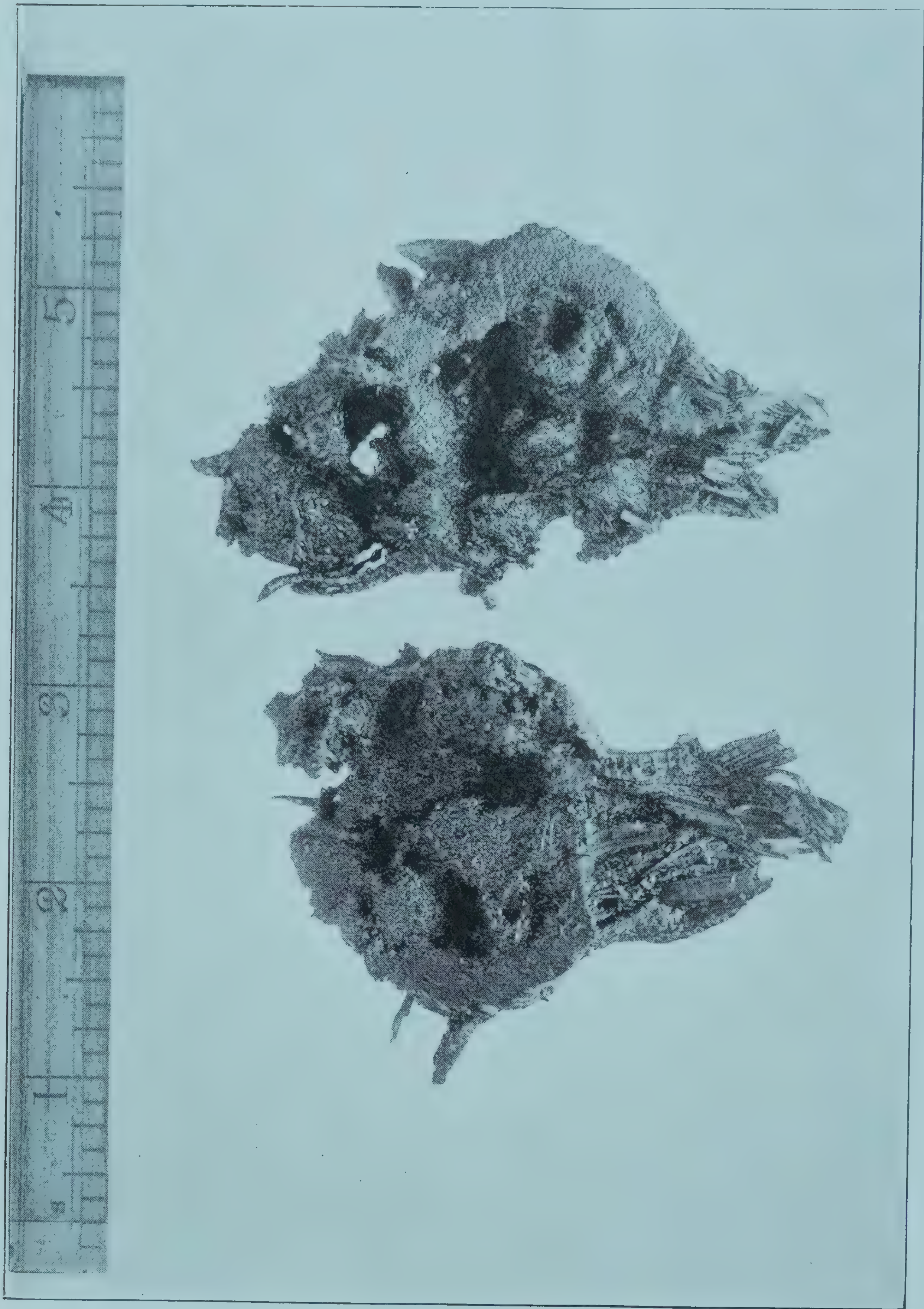

PLATE 43.—WORK OF TWO LARVÆ OF C. SORDIDUS ON BANANA SUCKER.—INTERIOR VIEW.

a colour under which the beetles, even if not markedly attracted to it, will not be driven away. No marked positive results have, so far, been obtained.

Several oils and essential principles are being tested in order to ascertain any attractive or deterrent influences exercised by them on the beetles. All those tested to date have shown a more or less marked deterrent influence, which, however, has only been exercised over a very short distance and for only a very short space of time.

PLATE 44.—THE BEETLE.

A detailed account of the tests on the powers of locomotion and with the oils and coloured lights will be given at a later date, when a greater degree of conclusiveness has been reached than at present.

The food of the beetle consists of the corm or the material of the rotting stems. In most areas, rotting stems, *particularly* those lying on the ground, are always found to contain beetles, often in numbers. The amount of moisture in which the beetles live in these situations is remarkable. The beetles may not be present in the rotting stems solely for the purpose of feeding or propagation, but that of sheltering.

In order to ascertain the longevity of the beetles, a number have been kept in tins containing fine earth and corm; the earth absorbs any moisture from the corm on which the beetles feed. The following table shows the percentages alive on the dates given, the percentage being taken to the nearest whole number:—

Lot.	Approximate date collected, &c.	Number collected.	% alive on 3-3-21.	% alive on 22-3-21.	% alive on 4-4-21.	% alive on 19-4-21.	% alive on 28-4-21.	% alive on 9-5-21.	% alive on 20-5-21.	% alive on 25-5-21.	% alive on 27-5-21.	% alive on 8-6-21.	% alive on 10-6-21.	% alive on 13-6-21.	% alive on 16-6-21.	% alive on 20-6-21.	% alive on 22-6-21.	% alive on 24-6-21.	% alive on 27-6-21.	% alive on 29-6-2n.
A ..	29-1-21	38	78	74	68	68	66	63	63	61	61	61	61	61	61	61	61	61	61	61
B ..	7-2-21	132	97	69	54	34	32	31	31	31	31	31	31	30	30	30	30	30	30	29·5
C ..	12-2-21	281	83	56	52	37	36	36	36	36	35	34·5	34·5	34·5	34·5	34·5	34·5	34·5	34·5	34 5
D ..	20-4-21	37	..	..	..	..	100	92	89	89	89	89	89	89	89	89	86	86	86	86
E ..	27-4-21	16	..	..	..	..	100	88	56	56	56	56	56	56	56	56	56	56	56	56
F ..	5-5-21	87	..	..	..	..	..	100	100	100	100	99	99	99	99	99	99	99	98	98
G ..	21-5-21	379	..	..	..	..	..	..	100	99	99	99	99	99	99	99	99	99	99	99
H ..	24-5-21	26	..	..	..	..	..	..	..	100	100	100	100	100	100	100	100	100	100	100
I ..	4-6-21	324	..	..	..	..	..	..	..	..	..	100	100	100	100	99	99	99	99	99

With the exception of "Lot E," which were bred from nymphs, all the beetles were collected in the plantations, their age when collected being, of course, unknown. These observations show that the length of life of the beetle is of considerable duration.

The only insect-enemy so far discovered is the Elaterid larva first reported by Tryon from Cooroy. This predaceous insect has not been found outside the Cooroy district. A single larva was met with on the 25th February, 1921, with a partially consumed banana beetle in its jaws.

On several occasions it has been observed that, immediately after heavy rain, the number of beetles found under corm baits was very much less than before the rain. Generally, forty-eight hours after the cessation of rain the number of beetles found under the baits again begins to increase. So far the location of the habitat of the beetles at these times has not been definitely determined.

Under ordinary conditions, a proportion of the beetles shelter and move below the surface of the ground, as shown by the fact that baits laid adjacent to stools, and from under which the beetles have been removed in the morning, have been found to have additional beetles underneath them at midday; and after removing this second lot of beetles, the baits have been found to have further additional beetles underneath them in the late afternoon. An alternative explanation as to their source and mode of access to the baits appears to be excluded on considering the fact that the beetles have been proved to be abhorrent of ordinary light, and, though a close observation has been made, have never been found crawling on the surface of the ground during the hours of daylight, or at any time traversing the air.

OCCURRENCE.

In plantations in which, generally, the infestation is very marked, suckers are commonly found in which the larva has eaten out the centre of the corm and tunnelled upwards through the central core of the

stem to a height of about four inches above ground level, where it has eaten its way right round the stem. These suckers, naturally, look very unhealthy, and if an attempt be made to pull them out of the ground, they break off at this ring-tunnel; a well-developed larva is then usually exposed.

An unusual habit of the larva, observed so far only in one locality, is that of tunnelling upwards right through the centre of the stem of young suckers. This has been observed on the higher ground as well as on the lower levels. Although not of common occurrence, it is sufficiently prevalent to be noticeable.

The infestation of the beetle-borer is equally bad in plantations situated on the high ground and on low-lying levels, and is as severe on the ranges as on the seaboard.

In older plantations where the infestation is slight, the depredations of the larvæ may be confined to old corms in the centre of the stools or cut-stems lying on the ground. This does not mean, however, that such will necessarily be the case under all circumstances.

So far as has been observed, there does not seem to be any marked difference in either the relative frequency of, or the relative injury by, the pest with respect to "Cavendish," "Lady's Finger," or "Sugar" banana plants.

Corms dug out or stems with corm attached, left lying on the ground, may serve as breeding centres for a considerable time. In one case, in an area in which the beetles had been long established, corms which had been dug out four years previously and left lying on the ground were found to contain a number of larvæ and nymphs in addition to over 100 beetles, many of which latter were immature.

CONTROL.

It has been impracticable to enter upon investigations into means of controlling the pest to any extent. The only recommendations that can be made are, in effect, those previously published.

Wherever infestation is found in the stools, dig out and destroy all infested material and lay "split-corm" baits flat on the ground in the centre of and just outside these stools. Examine the "baits" at least each morning, and collect and destroy the beetles that will be found on the underside of the bait and on, or just underneath, the soil under the "bait." It has been noted that about three days elapse before the corm "baits" attain their maximum attractive power. It is advisable to destroy the baits after a fortnight has elapsed, in order to prevent any larvæ, from eggs deposited in the corm, from maturing. Cut-stems and plants that have fallen out of the stools must be examined from time to time, and where found to be infested must be destroyed.

The spreading of the pest into clean plantations is most carefully to be guarded against. When obtaining suckers for planting, the greatest care should be taken to ascertain that the plantation from which they are to be secured is free from banana beetle infestation. Eggs may be deposited in the suckers before or after removal from the stool, and the presence of the eggs, the detection of which is extremely difficult under the circumstances, if not impracticable, or even larvæ, be not noticed at the time of receipt.

Another factor that is too often lost sight of—a particularly important one when laying out a new plantation—is the presence of old banana cultivation adjacent to the area selected. It has been noticed that new plantations have been laid out adjacent to, and even alongside

of, old and often discarded banana cultivations in which the beetle-borer is still active. The beetles will ultimately spread from such old areas into the new plantations. In such cases the old area should be most carefully examined, and, if beetle-borer infestation be found, "baits" should be laid around the edge of, and, as far as possible, throughout the old area; all the beetles so "trapped" must be destroyed. It is to the growers' own advantage to dig out and destroy the plants in such old areas whenever opportunity offers.

NOTE.—This account of banana beetle borer investigations was issued as a special Bulletin by the Entomological Division of the Department of Agriculture and Stock at the Brisbane Exhibition, 9th August, 1921.

SPECIAL CATTLE FATALITY IN THE MARANOA DISTRICT, AND ITS RELATION TO THE LARVÆ OF PTERYGOPHORUS ANALIS, COSTA.*

BY HENRY TRYON, Entomologist, Department of Agriculture and Stock.

The peculiar fatality (Note 1) experienced by cattle, and attributed to their having developed a strange appetite for a special insect (spoken of erroneously as a "caterpillar") that has been reported from Roma during the present month (July, 1921), was experienced by graziers in a considerable area of the Maranoa district in 1911, 1913, and 1914, in annually increasing extent, occurring latterly as far as Moola Zembla Creek, beyond Westgrove, to the north of Roma, and to Waterhole Creek in the Surat district, to the south.

This occurrence at that time, as during the present season, was moreover restricted to a definite area of country characterised by the growth of a certain eucalypt tree—the Silver-leaved Ironbark with opposite leaves (*Eucalyptus melanophloia*, F. v. M.). This tree is the especially favoured food-plant of the insect now to be described. A second one to which it is much less addicted to feeding on is the local "Molly Gum." (Note 5.)

THE INSECT.

The insect, denominated a caterpillar, is not the young of a moth or butterfly, as is implied in the definition; but the young, or "grub," of a large hymenopterous insect—one of our Sawflies (so termed from the fact that the female is endowed with a saw-like organ that is employed in placing its eggs). It was named in 1864 by an Italian entomologist, G. Costa, *Pterygophorus analis,* owing to the male individual having feather-like feelers (antennæ). In addition to the saw-fly grub, then, we meet with the insect in other phases of existence—the winged insect, the egg, and the pupa or nymph.

DESCRIPTION OF INSECT AND HABITS.

Adult.—The Sawfly, *Pterygophorus analis, Costa* (Plate 45, Figs, 1 and 2). This is a glossy blue and yellow insect with the shining wings appearing almost black when folded, but really smoke-coloured, darker in front. It has the head and central shield of the thorax and some parts beneath dark steel blue. The female—the larger insect—measures about $1\frac{1}{2}$ cm. in length, and has a wing expansion of just twice this amount. It has its feelers threadlike. On its yellow abdomen beneath is the groove containing the saw-like organ and other instruments that are used in placing the eggs. The male (Fig. 2) on its part measures $1\frac{1}{4}$ cm. in length, with wings of the same relative length. It is more slender than its consort, and has the black feelers widely feathered on one side.

Egg.—The egg (Fig. 3) is an oblong, very delicate pale green object. The female lays several at a time—twelve or more. These it inserts into the tissue intervening between the two leaf surfaces side by side in a row along the leaf-edge (Figs. 3 and 4). In effecting this object, it settles astride on the latter, and exserting its saw, cuts a cleft for each egg, and then passes an egg into this. (Note 2.)

Larva.—The larvæ hatching from single rows of eggs at one time feed on the leaf where born, congregated together side by side, thousands of leaves on individual trees affording the different groups sustenance. Meanwhile, they may invade leaf

* This memorandum was submitted at the request of the Minister of Agriculture, and although based on investigations and inquiries made in 1914, it has application to the present occurrence in July, 1921. A special show-case illustrating fully the insect and its life history, the work of Hubert Jarvis, has been exhibited several times since the earlier date at the annual expositions of the Queensland National Association.

Del. Hubert Jarvis.]

PLATE 45.—SILVER-LEAF IRONBARK SAW-FLY (*Pterygophorus analis*), G. Costa.
[Tenthredinæ.]

after leaf. When fully grown (say, late in June) they crawl, forming a numerous host, along the branches and down the tree trunk to the ground, where they may congregate literally in heaps about its base, either to eventually enter the soil near at hand or to succumb to wet and cold (Plate 46). They are green unclothed caterpillar-like objects, with reddish-yellow horny heads; the bodies gradually taper backwards to a point. (Note 3.)

Nymph and Cocoon.—Having entered the ground, the larvæ still congregated together, form cocoons of a very tough, gummy, dark-coloured material. These are ordinarily placed side by side, and together they appear like blocks of exceedingly large-celled honeycomb. However, when the ''grub'' enters sandy soil to transform, its cocoons are made isolately, or two or three only occur adherent (Fig. 6). In these dwellings, one in each, the grub passes to the pupal state. In this it is a pale green object, lighter anteriorly, with the four wings and legs packed up in cases lying alongside the sides of the body. Under ordinary circumstances, the adult saw flies, male and female, emerge from the ground late in August or during the succeeding month. However, the time of appearance may be greatly retarded should conditions of drought obtain. This remark also applies to the development as nymphs from larvæ.

The larva and nymph, when crushed, have a strong odour of eucalyptus, and evidently some eucalypt oil finds presence in its body fluids.

CONDITIONS INFLUENCING PREVALENCE.

(1) *Opossums.*—When, nearly forty years since, the Maranoa district was being traversed, it was observed that these animals were very numerous indeed, and that they specially favoured the young foliage of the Silver-leaf Ironbark (*E. melanophloia*, F. v. M.) in feeding; in fact, the foliage they would render quite scanty. The same trees also yielded them abundant camping places. It has been above pointed out that it is within the leaf tissue, the younger especially, that the eggs of the saw fly are deposited. Thus, whilst feeding on this vegetable diet, they would also inevitably consume the ''caterpillar'' eggs that it contained; similarly, in reducing the foliage they would limit opportunities for egg-laying also. This being so, the enormous destruction of opossums in the Maranoa district during the last decade, and the prevalence of the saw-fly larvæ, and so of this cattle fatality, stand in the simple relation of cause and effect.

(2) *Tachinid Fly Parasite.*—A small dipterous insect, somewhat resembling an ordinary house fly, has been bred from the *Pterygophorus* larva. There is reason to conclude that under some circumstances, and in some seasons, this parasite acts as a formidable natural enemy in preventing the ordinary numerical development of the insect. On the other hand, there are conditions that act prejudicially to it, and so fail to restrain this. So then the ''caterpillar'' does not uniformly increase in numbers from year to year under the operation of other favouring circumstances.

(3) *Meteorological Conditions.*—Moreover with the prevalence of drought, although then the saw-fly larvæ (''caterpillars'') may enter the ground, to build cocoons and transform to pupæ, the realisation of this stage in their metamorphosis may be long suspended, since then they still persist within these constructions, in the grub condition. During the several months that may be thus occupied without the ordinary transformations taking place, many succumb to fungus and other diseases.

(*b*) When, on the other hand, rain and humidity are experienced, as the ''caterpillars'' descend from their feeding grounds in the tree tops and are reaching the ground, so prejudicial are their effects on them that myriads may succumb and decay. This may bring about fatality in stock, whilst it considerably abridges the insect's ordinary prolificness.

(4) *Natural Enemies—Birds.*—We have alluded to the operations of opossums and tachinid parasites. The potential controlling influence of insectivorous birds must not be overlooked. Their service can alone, however, be exercised when they locally exist in numbers. The paucity of such friendly agents in the Maranoa district, as compared with what occurred in years past is, however, such that to-day the check that birds might exercise on the number in which these pernicious insects occur is little indeed.

EATING OF THE INSECT BY CATTLE.*

In the absence of personal observation†, allusion may be made to abundant testimony, as establishing the fact, not only that cattle eat the so-called ''cater-

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* When the cattle fatality was first remarked in the Roma district, it was attributed to "cyanide poisoning" (accidental); the part played in it by insect ingestion must therefore be shown.

† Local inquiry on the part of the writer in 1914 was alone practicable when the insect had already temporarily disappeared.

Del. Hubert Jarvis.]

PLATE 46.—SILVER-LEAF IRONBARK SAW-FLY (*Pterygophorus Analis*) G. COSTA. (Tenthredinæ). Caterpillar Stage.

pillars,'' but that they may also manifest special keenness in exercising this abnormal appetite for them, as they occur congregated at the immediate feet of their host-trees, the Silver-leaved Ironbark, and Molly box trees—Eucalyptus sp., to a much less extent.

The fact that it is an abnormal appetite is evident from the experience of the 1911 occurrence, and from the 1914 one especially, ''There is plenty of grass . . . my stock have a craving for green feed, and take to the caterpillars'' (S. Sidney, August, 1911). The cattle ''had plenty of good grass, but much preferred eating caterpillars'' (J. C. Boyce, 26th August, 1914).

It is evident, too, that, however this strange habit has originated, the cattle eventually display especial eagerness in securing and consuming the insects. ''I have seen the animals deliberately eating the grubs,'' stated J. D. Thomson. ''Cattle fight for a place in their efforts to satisfy their craving for the larva'' (S. Inspector J. E. Smith). Again, ''When the cattle get a taste for them they go nearly mad; they turn from tree to tree licking them off the trees a foot at a time'' (S. S. Bassett, August, 1914).

EATING THE DEAD INSECTS.

Testimony as to cattle consuming the living insects is not quite conclusive. It is very significant, however, having regard to the effects produced, that they commonly partake of the dead ones. It was reported concerning experiences at Westgrove, in 1913, that the cattle victimised were ''eating heaps of dead caterpillars'' (S. B. Harding); again, ''I personally saw cattle eating up the heaps of rotting caterpillars—stinking heaps of caterpillars'' (Ib.)

Staff Stock Inspector J. Taylor elicited also similar testimony in 1914—*i.e.*, that ''The caterpillars die in heaps and are licked up by the cattle after they become a putrid and semi-putrid mass.'' (*Note.*—The writer has himself observed the masses when they had dried up.) (Note 4.)

OCCURRENCE IN ''STOMACHS.''

The insects being of a soft consistence, with somewhat tough skins, but having hard chitinous heads, would, it might be anticipated, if eaten, generally escape detection on any ordinary examination of the paunch-contents of the cattle that had eaten them. The following testimonies are, however, decisive of their occurrence therein:—(1) ''We have found the 'caterpillars' in the paunches of the dead ones'' (R. C. Lethbridge, 1913); (2) ''I opened about sixty-seven head here (Toogoombilla), and half of them had the heads of caterpillars in their paunches'' (D. Penthalwick, 1914); (3) ''I have found them in the paunch'' (J. W. Ward); (4) ''I opened several of the dead bullocks, and some were full of caterpillars; others had only a few in their stomachs'' (J. C. Boyce); (5) ''I have found portions of them in one cow's stomach, but I shot her before she got to the dying stage'' (S. R. C. Hardy).

ABSENCE OF INJURY ON EATING.

It would appear that not only may the insects be present under circumstances under which they might be partaken of, but also that, this being so, they may on occasion eat them with impunity. Mr. D. Smith, of Stewart's Creek, Roma, on this point stated:—''Cattle have been in a paddock very much infested with 'caterpillars,' and only a few died (2 miles away, 60 out of 100 head died). . . . I find that on parts of the run the cattle do not die so much, although the 'caterpillars' are just as thick'' (as elsewhere), and ''I have seen the cattle eat the 'caterpillars' and they are still living.''

Again, Stock Inspector J. E. Smith stated in 1914 that he had heard that the ''caterpillars'' occurred at Tarrawanya, 35 miles south-east from Roma, but had not learnt of any casualties in connection therewith. Without fatality, too, he had himself seen, whilst specially patrolling the Surat cattle-grazing area, in August, ''occasional patches of stripped ironbark trees, evidences of 'caterpillar' invasion.'' (*Vide* also ''Diet Deficiency,'' p. 213.)

FACTS CONFIRMATORY.

This evidence, bearing on the generally locally admitted conclusion that the ingestion of the insects alluded to has been the cause of the sickness and death of cattle experienced, finds corroboration in the fact that on moving the cattle from the country in which the insects and their food-trees occur, this loss and injury cease. ''Last winter (1913) about 100 head of cattle died from the effects of eating 'caterpillars' on Westgrove. . . . Three years previously (1911) about the same number died from the same cause. This winter (1914) I shifted all the sick from the infected country and had no losses'' (S. C. R. Harding).

(So also with regard to influence on occurrence of host-tree destruction.)

FACTOR OF DIET DEFICIENCY, &c.

It is well known that cattle under certain conditions and circumstances exercise abnormal appetites for one object or another—bones especially—as do also human beings in the case of soil or grit. Partaking of insects living or dead and decayed comes within this definition, and calls for explanation to be understood. In this connection a testimony as to the possible action of salt (sodium chloride) may therefore have some significance:—"I have lost 20 head of cattle through the pest. Mr. ————, one of my next neighbours, lost 75 head. In one paddock *where I salted*, they (the 'caterpillars' H.T.) are very thick, and the cattle don't seem to notice them, although they (the cattle, H.T.) are running from tree to tree looking for them in the paddock where I had no salt" (J. Jenkins, Timor, August, 1914).

The instinctive habit of endeavouring to overcome irritation in the alimentary canal from the presence of entozoa, by consuming non-food substances, must, too, be considered in this connection.

FACTOR OF WEATHER CONDITIONS.

In the season of any year when the insects are prevalent, and wet damp weather is experienced, the special loss in cattle now under consideration most prevails. This has been especially commented upon by Alexander Cummings, of Mount Beagle. When it is considered that the death of the insects arises, too, under the same circumstances, this relation may be understood, if, indeed, not accounted for.

AGE OF CATTLE AFFECTED.

The experience of graziers has been that it is principally young cattle that have evinced the peculiar fatality. "We have lost principally calves," stated J. D. Thomson. Again another testified, "I lost five young cattle" (A Cummings). Another, as to the animals affected, "They are principally young cattle up to 2 years old and in the best condition." A settler at Stewart's Creek (D. Smith) deposed, further, "Six head of weaners died out of eighteen, none of seven grown cattle."

This is not, however, the universal experience. Thus we learnt from J. C. Boyce, of Mooya, that he lost 40 bullocks from the cause alluded to (partaking of saw-fly grubs), several of which he opened. Again, referring to a particular holding, J. O. Thomson, of Kilmorney, stated, "I have seen 50 to 60 head of 2 to 3 year old steers dead on an average of about 4 to 5 square miles."

SYMPTOMS ARISING FROM THE INSECT DIET.

The clinical symptoms are a subject for the veterinarian to describe. Those that have attempted to picture them, in the absence of the necessary technical knowledge and experience, have failed. Evidently they are rather slowly realised, but take the form of much pain and distress. They certainly, according to all testimony, result in marked cerebral phenomena.

The patients "become restive" (J. D. Thomson); "they appear to suffer great pain" (J. W. Ward); "the affected beast becomes quite mad. It is very dangerous to approach" (Ib.); "they get staggers, also will charge very fiercely if one goes within 50 yards of them" (S. R. Harding).

The pathological state, revealed on post-mortem examination, had again only been indefinitely described when our information was elicited. This, again, is a matter for the veterinarian and animal pathologists.

With reference to the incidence of a fatal issue, it has been stated that "only very few recover after eating the caterpillars." "Three of mine recovered," stated the deponent alluded to (J. C. Boyce, of Mooya). He mentioned one animal that went without grass for fourteen days and then pulled through. "Some recover, too," stated Mr. E. D. Smith. Death, again, is rather slowly realised. Some cattle die in twenty-four hours, but usually only after a lapse of three to four days. "The time the animal eats the insects until the time of death is two to three days," stated D. G. Thomson.

SUMMARY AS TO CAUSE OF FATALITY.

1. Cattle under certain circumstances—those herein suggested above or others (a matter to be inquired into by the animal pathologist)—exercise an abnormal appetite and consume the grubs of a saw fly available in quantities, principally when dead and decaying; as also may happen with respect to true caterpillars and animal matter generally.

2. The symptoms as far as ascertained are not those arising from the consumption of ordinary hairy caterpillars (*Liparidæ,* &c.), these in the latter case being those of intense local irritation due to the presence of the peculiarly constructed hairs (so also with respect to Eucalyptus oil).

3. On the other hand, they appear to be not inconsistent with those of a generalised toxæmia when a ptomaine has become operative—a matter for the animal pathologist to decide.

MEASURES OF CONTROL.

Apart from the direct treatment of the cattle, which it would appear should be undertaken from two distinct standpoints—prevention and remedy—certain other procedures may serve to reduce the fatality that may occur.

1. *Medical Treatment.*—This is a matter for the veterinary practitioner, and possibly the difficulties with which it is fraught are not insuperable. It might be affirmed, as already suggested (p. 213), that in this regard the discovery of the origin of the abnormal appetite displayed by the cattle, and of precisely in what it consists, might point to a practical procedure for its removal or subjugation.

2. Other procedures above alluded to, being of the nature of preventative ones.

(*a*) *Local Protection of Opossums.*—Under ''Factors contributory in opposition to numerical increase'' of the insect. Emphasis has been made on the effect of reduction of opossum life in making for their prevalence, and how this reduction has operated to effect this result (p. 210). It is considered, then, that a close season for these animals throughout the area in which the Silver-leaf Ironbark (*Eucalyptus melanophloia*) grows and the saw fly (*Pterygophorus analis*) is using it as a host-plant, would be in the distinct interest of the grazier, whose cattle were liable to suffer.

(*b*) *Movement of Cattle from Areas of Ill-Repute.*—The host-plant of the caterpillar (saw-fly grub) grows principally in belts and patches, and in many cases it is practicable to withdraw them from these to grazing country, where the tree and its associated insect does not occur. Their pasturage on such new country need only be for about two months—last week in June to end of August. This method of safeguarding them effectively was demonstrated by S. R. C. Harding, manager of Westgrove, in 1914.

(*c*) *Destroying the Silver-leaved Ironbarks* (*E. melanophloia,* F.v.M.) in country has to be permanently devoted to cattle-grazing—by ringbarking. This has already been done to a large extent in the past. The ''application for permission to ringbark,'' that has to be made to the local Crown Lands Commissioner in accordance with the requirements of the ''*Land Act of* 1910,'' in Crown leaseholds is not likely to be withheld, seeing that the tree in question has no great value as a timber tree, and its local destruction would not apparently constitute sufficient forest reduction to minimise local rainfall.

(*d*) *Preventing Access of Stock to Caterpillars.*—Trees on which the insects are feeding can be recognised as such, and in practice it has been found that if boughs are placed at the bases of their trunks they will serve to debar access of cattle bent on reaching the insects that may congregate in masses in those positions.

Note.—It is anticipated that a strongly odorous substance sprayed upon the insect masses would also deter cattle visitation—''bone oil,'' for example. This is a matter for experiment.

(*e*) *Native Bird Protection.*—The very marked reduction in bird life in the Maranoa district, during the last three or four decades, principally brought about by ''cyaniding'' on the part of opossum and native-bear hunters, must be brought to a standstill, and an effort to encourage it stimulated. That special insectivorous birds destroy the ''caterpillar'' has not been observed by us, but that such is the case is highly probable; even the small parrots may serve this purpose.

(*f*) *Special Investigation into Pathology.*—It would seem probable that special investigation on the part of the animal pathologist are called for and likely to yield material results in reducing this cattle fatality.

SUPPLEMENTARY NOTES.

Note 1.—Although loss of stock, attributed to consumption of the saw-fly larvæ (''caterpillars''), has also been reported from other parts of the Maranoa area without details as to the number of victims, the following specific instances, in most of which this information is given, will be sufficient to indicate its seriousness:—

1911.—Reports were received as to its occurrence at Westgrove, Pinegrove, and Upper Yingerbay, 100 head (R.B.C.).

1913.—Similar reports were made with respect to Forest Vale, Stewart's Creek, Kilmorey, Westgrove, about 100 head (S.R.C.H.), Mount Beagle (A.C.), and Mr. Eden, 100 (A.C.).

1914.—In this year, again, the following losses were brought under notice:—Bungeworgorai, 16; Bungeworgorai, 30 (Mrs. L.); Roma, 15 bullocks (S.S.B.); Mooga, 30, including 20 bullocks (J.C.B.); Westgrove, several; Hutton Creek, 50 of 400 head (— McC.); East Lynne, 70-80 (J.W.W.); Timor, 20 (J.J.); Kilmorey, about 100 (J.D.T.); property adjoining Timor, 50-60 (Ib.); Stewart's Creek, 50 of 300 head (G.D.S.); Stewart's Creek, 60 of 200 (J.M.); Mount Beagle, 5 before cattle generally were removed; Mr. Eden, 100 (J.W.L.).

1921.—The occurrence in this year of fatality in cattle arising under the circumstances mentioned has not personally been inquired into, but the following statement in the Press will serve to show the extent to which it has been experienced:—"It can be proved that thousands of head of cattle in this district (north of Roma) alone have died as the result of eating these 'caterpillars.' On the road from Forest Vale to Eddystone Vale, dozens of carcasses can be counted in the timbered country from the roadside, and travellers are hardly clear of the stench from Simpson's Creek to the former station."—Mitchell correspondent in *Queensland Grazier and Farmer,* Brisbane, 4th August, 1921. (*s.v.* "Caterpillar Plague—Mortality in Cattle.")

Note 2.—The special organ used in making provision for the deposition of the eggs and the act of oviposition itself are alike remarkable. Generally speaking, the former consists of two elongated bodies, resembling the five sides of an ovate lanceolate leaf that are folded together enclosing a cavity, acting both as a sheath and director (Plate 45, Fig. 2c), within the latter being enclosed two elongated horny laminæ, each of which has two series of square-ending teeth on one side (Plate 45, Fig. 2d). These laminæ, although closely adjusted side by side, are capable of independent movement, and utilisable as saws, the four organs being packed in a depression between two lips. The mother insect, when about to lay its eggs, settles with its legs astride, with the ovipositor still concealed in the under abdominal surface, and, this done, it grasps firmly the leaf margin between the two labia or lips that enclose it. The saw fly then arches its body, the hinder dorsum of the abdomen being nearly perpendicular. The director, with the saws that it ensheaths, having its longitudinal groove facing anteriorly, then is freed from the groove between the labia, its tip touching the leaf border just in front of where it is clasped. The saws, with their teeth forward, then commence to move rhythmically up and down, issuing in doing so slightly from the groove in the director. Meanwhile they—the director and saws—enter the slit then gradually opened by their agency; the latter then cut rapidly with a few strokes an oblong chamber. This being made of sufficient size, the saws cease their up and down cutting movement and an elongated egg is then passed into the cavity that it nearly fills, the passage of the ovum appearing as the continuous flowing in of a transparent body of soft consistency. The director is then removed; the labia release their hold, the insect moves forward along the leaf edge about the width of their egg-chamber, and here a similar egg-chamber is made and filled after the manner described beyond the one already made. So successive eggs are placed in a band of egg-chambers forming a ribbon along the leaf margin, the edges of the wound in the leaf margin uniting so closely that not only does no death of the injured tissue ensue, but even the normal leaf-colour is scarcely altered.

Note 3.—The following is a more comprehensive description of the saw-fly larva ("caterpillar") than that given on pages 208 and 210:—*The Larva.*—Elongate, semi-oval in section, with the sides of the body erect, this latter, too, curving upwards and broadened towards the head, and sloping downwards, and narrowed gradually, from the fore-segments backwards, being terminated in a gradually compressed awl-shaped tail. The head is roundish, pale-reddish-yellow, minutely and evenly speckled with colour of a darker hue. The body above is glossy, almost smooth, and yellowish-green, and is gemmed with nitid low round boss-like whitish granules. Of these, two transverse rows, about 6 in. each, of rather larger ones with dark centres, occur on the second and third thoracic segments. The smaller granules vary in size; a row of larger compressed ones, one on each segment, extends longitudinally on each side of the middle line. A reddish suffused patch may cross the insect just proximad of the origin of the "tail." The undersurface is plain, showing eight abdominal segments, sides below projecting slightly outwards, the lower margin being festooned with eight rounder lobes. The thoracic segments, with three pairs of legs, each with a 1-jointed short tarsus, ending in a little rounded tuberosity and a piceous coloured claw. Abdominal segments with five pairs of broad pseudo-podia (false legs), terminally wrinkled. Length, 25 cm.

Note 5.—Whilst, at present, some uncertainty exists as to the identity of the tree, regarded locally as the less favoured food-plant of the saw-fly larvæ, and designated "Molly gum," and that some residents of the district speak of it also as "Gum-topped box," it may be mentioned that a second eucalyptus species that the writer has himself observed to be sparingly fed upon by the insects, has, on the evidence of specimens referred to the Government Botanist (C. T. White), been found to correspond to a plant figured in Maiden's "Critical Revision of the Genus Eucalyptus" (Pl. liii., fig. 15A), that the latter regards as a lanceolate leaf form of *E. melanophloia* (its proper host-plant), and that Bentham, who recorded also that it was the gum-topped box of the Suttor River, referred to a form of *Eucalyptus crebra.* It may be added with regard to the Silver Ironbark, and the insects injurious relative thereto, that not only may several of the "grubs" occur upon a single leaf, but they may be generally so numerous as to completely defoliate, within a few days only, the trees on which they occur—often throughout considerable areas.

Note 6.—The fatality in the cattle, consequent on their having eaten the dead saw-fly larvæ (that may occur after rain to the extent of 90 per cent.), accompanied with the living ones (T. Murray), and that would appear to be due to the action of a ptomaine that it is expected would originate in the decay of these insects, may be likened to the similar result that, as has been stated, often follows the gnawing and even consumption on their part of bones, to which decomposed, though dry, meat may still be attached. It, however, has a more close parallel, in certain experiences in Palestine, described by Samsonoff. This investigator has recorded the fact that in the Hedera district, it had been noticed that the hordes of migratory locusts had either filled with their dead bodies the shallow wells in the neighbourhood of the marshes; or had, on dying in the water, caused it to develop a greenish-yellow colour. Also, that cattle and other domestic animals that had been watered at these wells had succumbed after exhibiting grave cerebral symptoms; whilst similar animals, that had drunk the water of wells to which the locusts had not gained access, or that of running streams, had remained unaffected. (*Vide* Samsonoff—"Intoxication des ruminants par les sécretions du criquet pèlerin." *Rec. Méd. Vet.* 1919, Oct. 15, vol, 95. No. 19, pp. 556-565, and Abstract. *Trop. Vet. Bull.*, vol. 8, No. 1, p. 91-2. Mar., 1920.)

Note 7.—W. W. Froggatt, Government Entomologist, N.S. Wales, in a paper, "Notes on Australian Saw-flies (Tenthredinæ) written in 1918 (Proc. Lin. Soc. N.S.W. 43, 3 Oct.) intimates—under *Pterygophorus analis,* G. Costa (*Ann. Mus. Zool,* Napoli, II., p. 66, 1864)—the fact of cases being recorded from the Roma and Mitchell districts; also, of the death of cattle that have been alleged to have acquired the abnormal habit of eating the larvæ of this insect that are described as moribund; and in support of this statement cites a communication from Mr. Moore, of "The Peaks," Marbango, on the subject, and whose experiences relate to 1917 (*Op. cit.*, p. 671-2).

DESCRIPTION OF PLATES.

PLATE I.—1. Male saw fly; 1A. Antenna of male; 2. Female saw fly; 2A. Antenna of female; 2B. External aspect of groove containing ovipositor, labia, &c.; 2C and 2D. Organs forming ovipositor; 2C. Sheath or director, with joint-structure at one end; 2D. The two saws, separated; 3. The egg; 4. Ribbon of egg-cells within tissue of leaf of *Eucalyptus melanophloia* (reduced); 4A. Another view, eggs exposed; 5. Saw-fly larva (so-called "caterpillar"; 6. Larva within cocoon as formed in sandy soil (reduced); 6A. Larva, removed from cocoon prior to pupation. Note, on comparison with 5, stunted form, &c.

[From Drawings by Hubert Jarvis, Entomologist.]

PLATE II.—The larvæ "caterpillars" descending tree trunks prior to entering ground to pupate, or prior to dying without transformation. Photographic representation.

PARASITIC INSECTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 8th August, 1921, from Mr. Edmund Jarvis, Entomologist:—

INTRODUCTION OF PARASITES.

This matter being considered of importance, preliminary steps have been taken to get into touch with entomologists in those parts of the world where scoliid wasps that might prove serviceable here are known to occur.

Several species of these "Digger-wasps" are obtainable for introduction, and very probably some of them might do valuable work in our canefields.

Before incurring the expense of introducing a parasitic insect, however, the knowledge of certain facts relating to its life-cycle, economy, and environment is essential; as without such information it would be impossible to decide whether a species, if introduced, would, in the first place, be likely to live in Queensland; or, if so, find suitable host grubs, or breed in a normal manner.

With a view to obtaining reliable and comprehensive data of this nature regarding certain species of scoliidæ that appear likely to meet our requirements, I have prepared a list of questions which, when replied to by the various entomologists approached, will considerably illuminate the matter, and enable me in the near future to report more definitely on this interesting form of control.

Bacteriologists who are at present experimenting with different diseases affecting the grubs of cockchafer beetles have also been consulted, and it is hoped that a measure of relief may be secured through the introduction of suitable bacteria, which under our warm climatic conditions should thrive and multiply abundantly.

FUMIGATING CANE BEETLES.

Since the manufacture last year, by Mr. Dawson, of Gordonvale, of a machine for administering carbon bisulphide to the soil, the merits of this fumigant have been rather freely discussed here, and it is proposed to look into the matter this season and conduct a series of field experiments.

Mr. W. F. S. Howe (Manager of Mulgrave Central Mill) happens to have had considerable experience with carbon bisulphide and obtained results against mature cane-grubs which appear conclusive.

I agree with him in thinking that many of the failures in past years resulted from applications having been made either at the wrong time—viz., when the soil was too wet—or in heavy land not properly cultivated.

The best results are usually obtained in well-worked volcanic or clay-loam soils at a time when they are thoroughly moist, but not wet enough to affect porosity. Such conditions generally obtain in light soils about two days after heavy rain, but it is an easy matter to make sure by testing one's land with a spade.

Although carbon bisulphide is much used by entomologists for controlling various soil-frequenting insects, it does not seem to have come into general use here against cane-grubs.

This may be owing to the following reasons:—

1. Its rather high cost.
2. The expense of distributing it by hand-injectors.
3. The difficulty of obtaining reliable men to apply it.
4. The want of knowing exactly *how* and *when* to apply it.
5. Doubts regarding the efficiency, or after effects, of such fumigation.

Now, by adopting some reliable mechanical treatment we at once get rid of objections Nos. 2 and 3, since our field applications would then be performed quickly, systematically, and with certainty, two rows of cane being treated at once by the machine as it passed along between the stools, while the labour involved would consist simply of a driver and one horse.

Seeing that such treatment is not practicable after cane has reached a certain height, fumigation would need to be commenced as soon as possible after flighting of the beetles; for by making an early start we secure a period of two months or more in which to treat young ratoon and late planted crops.

It is proposed, therefore, to direct experimentation during the coming season against the eggs and small grubs, the latter of which will doubtless succumb to ordinary fumigation.

Very little is known regarding the effect of bisulphide on the eggs of scarabaeid bettles, but I am inclined to think that the fumes would most likely penetrate the soft and rather absorbent chorion (egg-shell) of Lepidoderma.

However, this is a point to be determined shortly. Our interest at present centres in the machine and its possibilities, which it is to be hoped may be completed this season in time for Mr. Dawson to give a practical demonstration in the field.

If successful, it might pay us to advance another step, and, as suggested by Mr. Howe, manufacture our own carbon bisulphide, and so reduce the cost about one-half, which would satisfactorily dispose of objection No. 1.

Chemistry.

DIPPING FLUIDS.

TABLE A.—Pounds of Arsenic to be added to bring Fluid in Dip up to Standard Strength.

No. of Gallons in Dip	Pounds of Arsenic per 400 Gallons of Fluid found by Analysis. Water only 0.	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	Deduct for every ½lb. of Arsenic found by Analysis.	Standard Strength at 8 lb.
100	2	1·87	1·75	1·63	1·5	1·38	1·25	1·13	1	0·88	0·75	0·63	0·5	0·38	0·25	0·13	lb. 0·06	..
200	4	3·75	3·5	3·25	3·0	2·75	2·5	2·25	2	1·75	1·5	1·25	1·0	0·75	0·5	0·25	0·12	..
300	6	5·63	5·25	4·88	4·5	4·13	3·75	3·38	3	2·63	2·25	1·88	1·5	1·13	0·75	0·38	0·19	..
400	8	7·5	7·0	6·5	6·0	5·5	5·0	4·5	4	3·5	3·0	2·5	2·0	1·5	1·0	0·5	0·25	..
500	10	9·38	8·75	8·13	7·5	6·88	6·25	5·63	5	4·38	3·75	3·13	2·5	1·88	1·25	0·63	0·31	..
600	12	11·25	10·5	9·75	9·0	8·25	7·5	6·75	6	5·25	4·5	3·75	3·0	2·25	1·50	0·75	0·38	..
700	14	13·12	12·25	11·37	10·5	9·63	8·75	7·88	7	6·13	5·25	4·38	3·5	2·63	1·75	0·88	0·44	..
800	16	16·0	14·0	13·0	12·0	11·0	10·0	9·0	8	7·0	6·0	5·0	4·0	3·0	2·0	1·0	0·50	..
900	18	16·87	15·75	14·62	13·5	12·38	11·25	10·13	9	7·88	6·75	5·63	4·5	3·38	2·25	1·13	0·56	..
1,000	20	18·75	17·5	16·25	15·0	13·75	12·5	11·25	10	8·75	7·50	6·25	5·0	3·75	2·5	1·25	0·63	..
1,200	24	22·5	21·0	19·50	18·0	16·5	15·0	13·5	12	10·5	9·0	7·5	6·0	4·5	3·0	1·5	0·75	..
1,600	32	30·0	28·0	26·0	24·0	22·0	20·0	18·0	16	14·0	12·0	10·0	8·0	6·0	4·0	2·0	1·0	..
2,000	40	37·5	35·0	32·5	30·0	27·5	25·0	22·5	20	17·5	15·0	12·5	10·0	7·5	5·0	2·5	1·25	..
2,400	48	45·0	42·0	39·0	36·0	33·0	30·0	27·0	24	21·0	18·0	15·0	12·0	9·0	6·0	3·0	1·50	..
2,800	56	52·5	49·0	45·5	42·0	38·5	35·0	31·5	28	4·5	21·0	17·5	14·0	10·5	7·0	3·5	1·75	..
3,000	60	56·25	52·5	48·75	45·0	41·25	37·5	33·75	30	26·25	22·5	18·75	15·0	11·25	7·5	3·75	1·88	..
3·200	64	60·0	56·0	50·0	48·0	44·0	40·0	36·0	32	28·0	24·0	20·0	16·0	12·0	8·0	4·0	2·0	..
3,600	72	67·5	63·0	58·5	54·0	49·5	45·0	41·5	36	31·5	27·0	22·5	18·0	13·5	9·0	4·5	2·25	..
4,000	80	75·0	70·0	65·0	60·0	55·0	50·0	45·0	40	35·0	30·0	25·0	20·0	15·0	10·0	5·0	2·5	..
5,000	100	93·75	87·5	81·25	75·0	68·75	62·5	56·25	50	43·75	37·5	31·25	25·0	18·75	12·5	6·25	3·12	..
6,000	120	112·5	105·0	97·5	90·0	82·5	75·0	67·5	60	52·5	45·0	37·5	30·0	22·5	15·0	7·5	3·75	..
	..	..	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	..	6 lb.
	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	..	7 lb.

Pounds of Arsenic per 400 gallons of fluid, by analysis.

TABLE B.

GALLONS (AND PINTS) OF LIQUID CONCENTRATES, OR POUNDS OF POWDER CONCENTRATES TO BE ADDED TO FLUID IN DIP, ACCORDING TO POUNDS OF ARSENIC FOUND FROM TABLE A.

—	Liquid Concentrates.										Powder Concentrates.	
	1÷100		1÷125		1÷140		1÷160		1÷200		1÷200	1÷250
Pounds of Arsenic to be added to fluid in Dip.	Gals.	pts.	Gals.	pts.	Gals.	pts.	Gals.	pts.	Gals.	pts.	Lb.	Lb.
1	0	4	0	3	0	3	0	2½	0	2	2½	2
2	1	0	0	6½	0	6	0	5	0	4	5	4
3	1	4	1	1½	1	0½	0	7½	0	6	7½	6
4	2	0	1	5	1	3½	1	2	1	0	10	8
5	2	4	2	0	1	6	1	4½	1	2	12½	10
6	3	0	2	3	2	1	1	7	1	4	15	12
7	3	4	2	6½	2	4	2	1½	1	6	17½	14
8	4	0	3	1½	2	7	2	4	2	0	20	16
9	4	4	3	5	3	1½	2	6½	2	2	22½	18
10	5	0	4	0	3	4½	3	1	2	4	25	20
11	5	4	4	3	3	7½	3	3½	2	6	27½	22
12	6	0	4	6½	4	2	3	6	3	0	30	24
13	6	4	5	1½	4	5	4	0½	3	2	32½	26
14	7	0	5	5	5	0	4	3	3	4	35	28
15	7	4	6	0	5	3	4	5½	3	6	37½	30
16	8	0	6	3	5	5½	5	0	4	0	40	32
17	8	4	6	6½	6	0½	5	2½	4	2	42½	34
18	9	0	7	1½	6	3½	5	5	4	4	45	36
19	9	4	7	5	6	6	5	7½	4	6	47½	38
20	10	0	8	0	7	1	6	2	5	0	50	40
21	10	4	8	3	7	4	6	4½	5	2	52½	42
22	11	0	8	6½	7	7	6	7	5	4	55	44
23	11	4	9	1½	8	1½	7	1½	5	6	57½	46
24	12	0	9	5	8	4½	7	4	6	0	60	48
25	12	4	10	0	8	7½	7	6½	6	2	62½	50
26	13	0	10	3	9	2	8	1	6	4	65	52
27	13	4	10	6½	9	5	8	3½	6	6	67½	54
28	14	0	11	1½	10	0	8	6	7	0	70	56
29	14	4	11	5	10	3	9	0½	7	2	72½	58
30	15	0	12	0	10	5½	9	3	7	4	75	60
40	20	0	16	0	14	2	12	4	10	0	100	80
50	25	0	20	0	17	6½	15	5	12	4	125	100

TABLE C.—GALLONS (AND PINTS) OF CONCENTRATE TO BE ADDED TO BRING FLUID IN DIP UP TO STANDARD STRENGTH.

For Queensland Dip, Royal Dip No. 2, Australian Dip, 1 ÷ 160.	Pounds of Arsenic per 400 Gallons of Fluid found by Analysis.																Deduct for every ¼-lb. of Arsenic found by Analysis.	Standard Strength per 400 (Gallons).
	0 Water	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½		8 lb.
Gallons of Fluid in Dip.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	gls. pts.	
100	0 5	0 5	0 4½	0 4½	0 4	0 4	0 3½	0 3	0 2½	0 2½	0 2	0 2	0 1½	0 1	0 0½	0 0¼	0 0¼	..
200	1 2	1 1½	1 0½	1 0	0 7½	0 7	0 6½	0 6	0 5	0 4½	0 4	0 3½	0 2½	0 2	0 1½	0 0½	0 0½	..
300	1 7	1 6	1 5	1 4½	1 3½	1 2½	1 1½	1 0½	0 7½	0 7	0 6	0 5	0 4	0 3	0 2	0 1	0 0½	..
400	2 4	2 2½	2 1	2 0	1 7	1 6	1 4½	1 3½	1 2	1 1	0 7½	0 6½	0 5	0 4	0 2½	0 1½	0 0¾	..
500	3 1	3 0½	2 7½	2 5	2 2½	2 1	1 7½	1 6	1 4½	1 3	1 1½	1 0	0 6½	0 5	0 3½	0 2	0 1	..
600	3 6	3 4½	3 2½	3 0½	2 6½	2 5	2 3	2 1	1 7	1 5	1 3	1 1½	0 7½	0 6	0 4	0 2	0 1	..
700	4 3	4 1	3 6½	3 4½	3 2½	3 0½	2 6	2 4	2 1½	1 7½	1 5	1 3	1 1	0 7	0 4½	0 2½	0 1¼	..
800	5 0	4 5½	4 3	4 0½	3 6	3 3½	3 1	2 6½	2 4	2 1½	1 7	1 4½	1 2	0 7½	0 5	0 2½	0 1¼	..
900	5 5	5 2½	4 7½	4 5	4 2	3 7	3 4	3 1½	2 6½	2 4	2 1	1 6	1 3½	1 0½	0 6	0 3	0 1½	..
1,000	6 1	5 6	5 3	5 0½	4 5½	4 3	4 0	3 4½	3 1	2 6	2 3	2 0	1 4½	1 1½	0 6½	0 3½	0 1¾	..
1,200	7 4	6 9½	6 4½	6 1	5 5	5 1½	4 5½	4 2	3 6	3 2½	2 6½	2 3	1 7	1 3½	0 7½	0 4	0 2	..
1,600	10 0	9 3	8 6	8 1	7 4	6 7	6 2	5 5	5 0	4 4	3 6	3 1	2 4	1 7	1 2	0 5	0 2½	..
2,000	12 4	11 6	10 7½	10 1½	9 3	8 5	7 6½	7 0½	6 2	5 4	4 5½	3 7½	3 1	2 3	1 4½	0 6½	0 3¼	..
2,400	15 0	14 0½	13 1	12 1½	11 2	10 2½	9 3	8 3½	7 4	6 4½	5 5	4 5½	3 6	2 6½	1 7	0 7½	0 3¾	..
2,800	17 4	16 3½	15 2½	14 2	13 1	12 0½	10 7½	9 7	8 6	7 5½	6 4½	5 4	4 3	3 2½	2 1½	1 1	0 4	..
3,000	18 7	17 5½	16 4	15 2½	14 0½	12 7½	11 6	10 4½	9 3	8 2	7 0½	5 6	4 5½	3 4	2 2½	1 1½	0 4¼	..
3,200	20 0	18 6	17 4	16 2	15 0	13 6	12 4	11 2	10 0	8 6	7 4	6 2	5 0	3 6	2 4	1 2	0 5	..
3,600	22 4	21 1	19 5½	18 2½	16 7	15 4	14 0½	12 5½	11 2	9 3	8 3½	7 0½	5 5	4 2	2 6½	1 3½	0 5¾	..
4,000	25 0	23 3½	21 7	20 2½	18 6	17 2	15 6	14 1	12 4	10 5½	9 3	7 6½	6 2	4 5½	3 1	1 4½	0 6¼	..
5,000	31 2	29 2½	27 3	25 3½	23 3½	21 4	19 4	17 4½	15 5	13 5½	11 6	9 6½	7 6½	5 7	3 7½	2 0	1 0	..
6,000	37 3	35 0½	32 6	30 3½	28 1	25 6½	23 4	21 1	18 6	16 3½	14 1	11 6	9 3	7 0½	4 6	2 3	1 1½	..
	..	..	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	..	6 lb.
	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	..	7 lb.

INSTRUCTIONS FOR USE OF TABLES.

To find the amount of concentrate to be added to the fluid in a dip, ascertain first from Table A the necessary amount of arsenic in lbs., according to the strength of the fluid found by analysis. For instance, if the dip contains 2,800 gallons of fluid, and the analysis showed 5½ lb. of arsenic per 400 gallons, we find that 17.5 lb., or nearly 18 lb., of arsenic must be added to bring the fluid up to the standard strength of 8 lb. per 400 gallons. Should a dip owner wish to use a dip of lesser strength on account of dipping at regular shorter intervals, or during very hot weather, the figures at the bottom of the table may be used, and for an adopted standard strength of 7 lb. for above example only 10.5 lb. of arsenic should be added, and for 6 lb. standard strength only 3.5 lb.

Should the analysis show 5¾ lb. instead of 5½ lb., a slight reduction for the ¼ lb. may be made, using the figures in the last column of the table, this deduction amounting for 2,800 gallons to 1.75 lb., so that 17.5 lb. — 1.75 lb. = 15.75 lb., or 16 lb. of arsenic would have to be added to the fluid in the dip.

If a dip is to be recharged after cleaning out, the amount of arsenic necessary to be added is found by using the column for water (0). A dip of, say, 2,600 gallon capacity would require 48 lb. for 2,400 gallons and additional 4 lb. for 200 gallons, or a total of 52 lb. of arsenic.

To find now the gallons of concentrate or lbs. of powder concentrate, use Table B, and we find that 17.5 lb. or 18 lb. of arsenic is supplied by—

7 gallons 1½ pints of Cooper's Dip (1 ÷ 125).
5 gallons 5 pints of Queensland dip, or Royal No. 2 (1 ÷ 160), and
45 lb. of Vallo Powder Dip (1 ÷ 200).

Table C can be used to find the gallons of concentrate, of a strength of 1 ÷ 160, which is the strength of the majority of concentrates, necessary to be added, directly from the number of gallons of fluid in dip, and the analysis, similar to Table A, without the use of a second Table B.

J. C. BRÜNNICH, Agricultural Chemist.

Editorial Notes.

A Warning to Fruit-growers and Others.

From time to time advertisements appear in the public Press extolling the qualities of certain plants or fruits being offered for sale, usually at fancy prices, and some farmers, in consequence of these glowing accounts, are induced to make unwise purchases. Extraordinary and extravagant statements are frequently made which, from their very nature, to say the least, are gross exaggerations; yet, such is the credibility of uninformed human nature, that many people believe them and pay high prices for goods sold under attractive and misleading labels that may be purchased under their right names at a fraction of the cost of the camouflaged article. Again and again so-called novelties, more or less worthless, and which have already been thoroughly exploited, are advertised and find ready acceptance. Southern publications devoted to fruit culture have recently called attention to this phase of get-rich-quick business, and have instanced two cases. The first is that of the so-called "carringberry," which has been given an impossible pedigree, and for which fabulous yields are claimed. This wonderful plant turned out to be nothing else than the well-known loganberry, which had its known origin on the property of Judge Logan at Santa Cruz, California, and of which a specimen was growing at the University Gardens, Berkeley, California, prior to 1890. So the "carringberry" is anything but a new discovery. The other plant referred to is the so-called

"Mexican" passion fruit, which, according to Southern authorities, is none other than an overgrown variety of the common passion fruit. This fruit is known in Queensland as the "giant passion fruit," but a totally different fruit is understood when the term "Mexican" is applied here, as the fruit so designated is that of the plant known as *Tacsonia mollisima*, which is closely related to the genus passiflora, and belongs to the same natural order. It is sometimes known as the "banana passion fruit," and has been grown to a limited extent in Australia for a number of years, but practical orchardists have never seriously entered upon its cultivation. Many other instances of much over-rated fruits and plants may be cited, but these two are sufficient to stress the necessity of the continuance of caution on the part of men on the land in respect to invitations to purchase goods for which extravagant claims are made. No really genuine article requires excessive advertisement. It sells on its merits; hence growers and others interested would be well advised to accept with caution accounts of plants advertised as something not merely of superior quality but of superlatively profit-producing possibilities. Recognised Australian nurserymen are fully alive to this sort of exploitation, and are able to give reliable information respecting any much-boomed plant or fruit. It will be found that, more than likely, they have already tested it and are able to say whether it is worth growing or not.

* * * * * * * *

To Cotton-growers. As the end of this year's cotton-ginning operations is in sight, this Department cannot receive seed cotton later than 20th September. Every bag should be branded with sender's initials and a letter of advice posted as soon as the consignment has been placed on rail.

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Tractor Ploughing. The time and labour saving possibilities of tractor ploughing were demonstrated at Mr. F. A. Stimpson's dairy farm near Dutton Park on 15th August in the presence of a large gathering of farmers and others interested in agriculture. The tractor is of the caterpillar type, and has the appearance of an adaptation of the small high-speed whippet tanks which were used during the last stages of the war. It did its work in heavy soil wonderfully well, trailing two ploughs—a treble furrow and double furrow mould-board, each with rolling coulters. The condition of the field operated on was not quite favourable, being in parts wet and sticky, and the going was, consequently, very heavy. The test was therefore fairly severe, but the tractor surmounted every difficulty with ease. The work was done on second speed, something over 2 miles an hour, and the five furrows were cut each a foot wide and about 8 inches deep. An additional factor adding to the severity of the task was that the land had not hitherto been so deeply ploughed. Every one present was impressed with the efficiency and economy of the machine. Handling was reduced to a minimum. Once the engine had been cranked, the entire operation was controlled from the driver's seat, proving it to be entirely a one-man job. The tractor moved on a 13-inch "tread," and made a light impression even on soft land, and there was no evidence of its packing the soil. The demonstration generally was highly successful.

* * * * * * * *

The Cassaba Melon. The notification in the August Journal that a small quantity of seed of the cassaba melon was available for distribution at this Office brought many hundreds of applications from all parts of Queensland, and quite a number from the Southern States. The supply at our disposal was very limited, consequently the number of seeds for distribution to each applicant had to be reduced to three. A number of requests reached us after our supply had been exhausted, and in order that each may be met, efforts are being made to obtain a further supply from an outside source. So far as possible, every request will be complied with. The seeds should be sown in September in accordance with the general directions given in our last issue.

* * * * * * * *

Dehydration. The section of a dehydrator shown in full working order at the Brisbane Exhibition became the focal point of great public interest. In the course of the week of operation quantities of pines, bananas, papaws, cocoanuts, and several varieties of vegetables were successfully treated. The plant, which forms a unit of a complete 8-section dehydrator to be erected at Beerburrum in time to treat the coming season's crop, is now being transferred to that centre.

General Notes.

"THE PURE SEEDS ACT OF 1913" AS AMENDED BY "THE PURE SEEDS ACT AMENDMENT ACT OF 1914."

The abovementioned Acts, are intended to regulate the sale of seeds for planting or sowing—that is to say, all vendors of seeds must comply with the Acts and Regulations thereunder.

VENDOR.

A vendor within the meaning of the Act is—

> "Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds."

It will, therefore, be noted that the common acceptance of the Acts as referring only to seedsmen is erroneous. A produce merchant, storekeeper, auctioneer, farmer, or grower of the seed are vendors under the Acts whenever they sell, offer, expose for sale, contract or agree to sell any seeds for sowing.

INVOICE MUST BE GIVEN BY VENDOR.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

FOREIGN INGREDIENTS.

Foreign ingredients include dead and non-germinable seeds, diseased or insect-infested seeds, weed seeds, or seeds of any cultivated plant other than that to which the sample purports to belong. Also inert matter, which includes chaff, dust, stones, or any material other than seeds, and broken seeds less in size than one-half of a complete seed.

The proportion or amount of foreign ingredients that may be contained in any seeds is prescribed by the Regulations, copies of which may be obtained from the Government Printer, William street, Brisbane, for 4d. post free.

B GRADE SEEDS.

Seeds in which the amount of foreign ingredients exceeds the proportion set forth in Schedule A of the Regulations, but does not exceed the proportion set forth in Schedule B, may be sold as seeds for sowing, providing they are contained in bags or packages to each of which is affixed a label, brand, or stamp, clearly and indelibly marked, specifying: The kind or kinds of such seeds; that the seeds are B grade, for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed; the name and address of vendor. All invoices relating to such seeds must be distinctly marked "B Grade Seeds."

SAMPLES FOR EXAMINATION.

In order to ascertain if seeds comply with the Acts, samples may be submitted for examination.

The weight of such samples must not be less than the amount prescribed by the Regulations, which are as follows:—

Weight of Sample to Mail.

Wheat, oats, barley, maize, rice, rye, peas, cowpeas, beans, tares	8 oz.
Millet, sorghum, sudan grass, panicum, buckwheat, lucerne, clover, linseed, prairie	4 oz.
Rhodes, paspalum	2 oz.
Turnip, cabbage, parsnip, carrot, and vegetable seeds of like size	½ oz.
All seeds other than those included above	2 oz.
Vegetable seeds in make-up packets	3 packets.

In the case of samples containing a large amount of foreign ingredients, it is advisable to send double the weight mentioned.

When drawing a sample care should be taken to obtain a quantity from the top, bottom, and middle of each bag. These should be thoroughly mixed to ensure the sample being uniform.

Every sample sent should have the following particulars plainly written thereon:—

Name of seed.
Quantity that the sample represents.
Name and full address of sender.

If the result of the examination is required for purposes of sale, a fee of 2s. 6d. per sample will be charged.

No charge will be made to farmers sending in samples of seed which they have purchased as seed for sowing, providing the following particulars are given:—

Vendor's name and address.
Name of seed.
Quantity purchased.
Date of delivery.
Locality where seed is to be sown.
Name and address of purchaser.

Samples, with covering letter, should be addressed to—

UNDER SECRETARY,
DEPARTMENT OF AGRICULTURE AND STOCK,
BRISBANE.

August, 1921.

PUBLICATIONS RECEIVED.

The Journal of the Ministry for Agriculture (United Kingdom) for July contains Professor R. C. Punnett's (University of Cambridge) concluding article on "Research in Animal Breeding." The tangle of sex and its dependent characters are illuminatingly set out. "One of the most striking points of difference between the higher animals and plants is that in the former the sexes are separate, while the latter are most often hermaphrodite," is the writer's opening observation, and he goes on to deal with further points of Mendelian inheritance. The whole series of articles comprise a very valuable contribution on sex heredity. Other informative contributions are: "The Dairy Shorthorn," "Grading and Packing of Fruit," "Mosaic Disease of Potatoes," "Liming," "Potato Trials, 1920," and "The 1920 Lincoln Tractor Trials."

The International Review of the Science and Practice of Agriculture (Rome) for May is made up of many valuable abstracts from the world's agricultural Press, chief among which are notes on rural hygiene, tillage and methods of cultivation, an account of how the drought problem is dealt with in Brazil, and notes on agricultural chemistry, live stock and breeding, farm engineering, rural economics, plant diseases, and entomology.

The Agricultural Gazette of Canada (May—June) has listed among its leading topics—"Fighting the Grasshopper," "Co-operative Marketing of Fruits and Vegetables in British Columbia," "Restoration of the Apple Orchard to Pre-War Productiveness," and "Prevention of Loss in the Shipment of Fruit and Vegetables."

La Revista Agricola (Mexico) for June is particularly interesting to horticulturists. It contains a fine article on rosegrowing, in addition to much other informative contributions of general interest to the tropical agriculturist.

The *Bulletin of the Department of Agriculture, Trinidad and Tobago* (Trinidad), 1921, Part 2, vol. XIX., has among its leading topics an account of sugar-cane experiments, 1918-20, by Joseph de Verteuil, F.I.C., F.C.S., Superintendent of Field Experiments, Trinidad.

The Journal of Heredity (U.S.A.), vol. XII., No. 2, February, 1921, covers a wide area in its chosen fields of plant-breeding, animal-breeding, and eugenics. Included in its original matter are articles entitled "Inheritance in Swine," "Heritable Characteristics of Maize," "Inbreeding and Cross-breeding," and "Polydactylism in Cattle."

The Journal of Dairy Science (U.S.A.) for May features the following:—"The Influence of Calcium and Phosphorus in the Feed on the Milk Yield of Dairy Cows," "Official Grading and Control of Dairy Produce for Export," and "Historical Notes on Cotton Seed as Food."

The Indian Forest Records (Calcutta), Vol. VIII., Part II., by R. S. Hole, C.I.E., F.C.H. (Botanist, Forest Research Institute, Dehra Dun) is a well-illustrated production covering an account of "The Regeneration of Sal (*Shorea robusta*) Forests—A Study in Economic Œcology," and is replete with valuable information on the results of some forestry experiments in India.

The Agricultural Journal of India (May) features among its original articles notes on "Improved Field for Agricultural Investigations," by S. Milligan, M.A., B.Sc., Agricultural Adviser to the Government of India. Other notable contributions include "Cambodia Cotton (*Gossypium hirsutum*)—Its Deterioration and Improvement," by G. R. Hilson, B.Sc.

The *International Review of Agricultural Economics* (Rome) for April has an account of the agricultural co-operative movement in Germany in 1918-19, a review of the organisation of co-operative grain elevation companies in the United States, and contains, besides, much miscellaneous information relating to co-operation in Algeria, Egypt, France, Great Britain and Ireland, and Holland, and economic and social conditions of agricultural classes in European countries.

The Rhodesia Agricultural Journal (June) covers a notable memorandum on the cattle industry in Southern Rhodesia.

The New Zealand Journal of Agriculture (July) has among its main features an article on the abortion disease of cattle, by H. A. Reid, D.V.H., F.R.C.V.S., Veterinary Laboratory, Wallaceville. Other contributions include "The Introduction into New Zealand of *Aphelinus mali*, a valuable parasite of the woolly aphis," by R. J. Tillyard, M.A., D.Sc., Entomologist and Chief of the Biological Department, Cawthron Institute of Scientific Research, Nelson; "Commercial Potato-growing" by H. E. McGowan, and "Standard Fruit Grading and Packing," by J. A. Campbell, Director of Horticulture.

The Journal of the Department of Agriculture of South Australia (July) continues an account of some feeding tests with pigs. Other informative feaures are notes on agricultural experiments and downy mildew in South Australian vineyards.

The Journal of the Department of Agriculture, Union of South Africa (July) has among its principal contents "Motor Tractors," "Spineless Cactus as a Fodder for Stock," "Pest Remedies—Insecticides and Fungicides," and "Moisture in Maize."

The Agricultural Gazette of New South Wales (August) has amongst a mass of general information a concluding article on "The Feeding of Sheep in Times of Drought," an article on "Co-operation for Farmers" (C. C. Crane, B.A.), a further contribution on "Producing Lucerne Hay under Irrigation Conditions—Methods and Experiences at Yanco Experiment Farm" (F. G. Chomley and F. Chaffey), and a report of "Some Germination Tests of Prickly-pear Seeds (E. Breakwell, B.A., B.Sc.).

OCTOBER SHOW DATES.

Toombul A.H. and I. Association: 30th September and 1st October.

Mount Larcom, *via* Gladstone: Wilmott Farmers' P. Association: 8th October.

Ravenshoe F.G. and P. Association: 12th and 13th October.

Innisfail, Johnstone River, A. Society: 14th and 15th October.

Malanda.—Millaa Millaa Settlers' P. Association: 19th and 20th October; and Eacham P.A.I. Society: 19th and 20th October.

Answers to Correspondents.

SILVER FISH (LEPISMA).

C. G. Y., Wowan—

Your application for direction as to measures for controlling Silver Fish in the house was submitted to Mr. Henry Tryon, Government Entomologist, who advises as follows:—

"These insects are very difficult to cope with, owing to the fact they have no resting period—being ones that undergo no metamorphosis, and to their obscure habits; again, since they can subsist long without food or that contained in dust and their cast skins only.

"Their most favoured aliment is starch and sugar, and glazes made of the former substance, and used for dressing silk or cotton fabrics or various forms of cardboard or papers. An incorporation of arsenic in the bodies of this nature, where its

presence is not otherwise forbidden, will both serve to protect them and kill these domestic pests.

"As a rule, exposure and thorough airing of articles amongst which they resort serves temporarily to banish them, especially if receptacles that have contained these receive at the same time a thorough brushing out.

"Pyrethrum powder (Insectibane) dusted in places that are harbours for them again serves to repel them; so also crushed "mothballs" (naphthaline). Boracic acid applied in the same manner may be useful for the purpose, too, but I have no evidence that this is so.

"Further, one can dip pieces of cardboard or strong paper in a sweetened flour-paste containing a trace of arsenic, or 'white ant cure,' and when the latter has dried upon them, place these pieces in crannies resorted to by silver fish, and so many may be destroyed. In putting linen and cotton articles away for a period, it is as well—if this be admissible—to wash whatever starch they may contain from them before doing so. This especially applies to delicate fabrics such as muslins."

PISE HOUSES.

J. Rice (Springfield, Townsville).—The Surveyor, Department of Agriculture and Stock (Mr. Arthur Morry), to whom your request for information was referred, replies as follows:—

"1. Pisé walls will resist cyclonic storms admirably. The roof would require some special attention on account of the overhang, which is primarily intended to protect the walls against wet weather. Cyclonic storms may get under the eaves, but if the projecting ceiling joints are carefully anchored down by ironbark posts, as suggested by correspondent, no harm would be likely to arise. Low or flat roofs are a good protection against cyclones.

"2. A house constructed as per plan in the situation named would have a good residential value, as it would be a permanent structure, and subject to very little depreciation, but for removal purposes its value would be limited to fittings, fixtures, and material, which could be used again.

"3. Suggest you write to Manager, State Advances Corporation, Brisbane, in connection with this question.

"4. Ant bed could be used for pisé buildings if treated properly, but it is a question not yet determined as to whether its superiority is so much in excess of normal pisé material as to justify the extra labour involved in its preparation. Formic acid is the ingredient which makes ant bed so hard. No machine of the kind mentioned by the correspondent for reducing ant bed is known, and it is questionable whether results would justify the expense. Ant bed can be worked up into a paste with water and plenty of puddling, when grinding would be unnecessary."

THE CULTIVATION OF THE DATE PALM.

John McNulty (Thursday Island).—Your request for information on the cultivation of the date palm was submitted to the Director of Fruit Culture (Mr. Albert H. Benson, M.R.A.C.) who advises as follows:—

"This palm requires to be grown in a deep sandy soil, in a hot, dry climate. Water for irrigation must be available. The natural habitat of the date palm are the oases of Northern Africa and of the Persian Gulf, where there is great heat to ripen the fruit, and sufficient moisture in the soil to grow the palm to perfection. The only districts in Queensland in which the date is capable of being grown commercially are our dry inland regions, where there is little or *no frost* but great heat, sandy soil, and water for irrigation. The date will not stand an excess of salt; it is therefore doubtful if it would thrive on the western side of the Cape York Peninsula on the soils mentioned, even though the climate were favourable."

PINEAPPLE FERTILISER.

A. McC. (Lissonagh, Kuraby).—Superphosphate must on no account be used for pineapples. A formula approved by Mr. A. H. Benson, Director of Fruit Culture, and which is producing very good results at Beerburrum, is—

Dried blood	400 lb.
Sulphate of potash	200 lb.
Holborne Island phosphates	150 lb.
Total	750 lb.

TO EXTIRPATE SCOTCH THISTLE (CARDUUS LANCEOLATA).

A.G.N. (Scrubby Creek, Howard).—If infestation is heavy, we would suggest mowing before the thistles reach maturity, and stacking for ensilage. When so conserved they possess valuable nutritive qualities. Spraying with poison is expensive and highly dangerous to stock, particularly horses, which at certain periods of growth are very fond of Scotch thistles. Where paddocks are entirely overrun with thistles they become in time "thistle sick." Instances of this are frequent, and paddocks almost impassable from this cause become, as a consequence, entirely free.

MIXED FARMING.

"Clough East" (Murgon).—Recommend concentration of energies on improvement of stock, and conservation of fodder in the form of ensilage and so on. Rotation crops you will find will be better paying propositions in your district, as adjuncts to dairying, than from a cereal-production point of view. We are in this instance referring to wheat, oats, and barley being used in rotation with lucerne. Maize, of course, is another matter, and can be grown as a commercial side line. This Department will be pleased to co-operate with you in experimental work in grain, sorghum, and other crops, and you are advised to get in touch with the Director of Agriculture, intimating your willingness to take up this class of work, for which you will be compensated.

Stock at State Farms for disposal:—State Farm, Warren—Ayrshire cattle and Berkshire pigs. Queensland Agricultural College, Gatton.—*Cattle*—Ayrshires, Guernseys, Jerseys, Friesians. *Horses*—Clydesdales. *Pigs*—Berks and Yorks. Kairi State Farm.—*Cattle*—Illawarra, M.S., Jerseys. *Pigs*—Berks. Gindie State Farm.—*Cattle*—Beef Shorthorns. *Horses*—Suffolk Punch.

FOR POISONING TREES.

A.H.K. (Wilsonton, Toowoomba).—Formula—

Arsenic	1 lb.
Caustic soda	2 lb.
or	
Washing soda	3 lb.
Water	4 gals.
Whiting	½ lb.

Method.—Mix the arsenic into a paste with water. By diluting a little and mixing with caustic soda great heat is generated, and the arsenic becomes dissolved. Additional water should be added to make up the required 4 gallons. When using washing soda, proceed as before, and add gradually to soda solution, boiling for at least an hour until arsenic is dissolved. Keep the whole solution well stirred. The arsenical fumes being dangerous, care must be taken to avoid inhalation during the boiling process. The whiting is used for the purpose of showing up by means of its colour areas treated. This poison should be poured into a frill cut into the bark and encircling the tree.

CATERPILLARS IN LUCERNE.

In lucerne affected by the larvæ, cut the crop, when most of the cocoons are formed (this is indicated by the leaves curling) and stack either in the form of ensilage or allow it to reach the stage when it will make sweated hay. The temperature so caused is sufficient to kill the grub, and the value of the hay as fodder is not detrimentally affected. As soon as the crop is removed, the paddock should be well rolled and cross rolled. Harrowing during frosty weather would be beneficial, having a tendency to bring to the surface and expose any larvæ that may be perdu.

PIT SILOS.

E.A.T. (Humberton, Roma).—It is not advisable to slope the sides of a pit silo, as in so doing the settlement of the material pitted is necessarily impeded. The less friction set up in the process of settlement the less air will be admitted, and consequently better ensilage will result, fermentation thereby being prevented. Under any circumstances the sides of all pit silos should be lined with wood, brick, or concrete (preferably the last), and the pit made impervious to water.

MOTOR PLOUGHS.

H.T.M. (Burnham Farm, Woombye).—Several makes of the class of motor plough to which you refer have lately appeared on the American market, but no further particulars have been received of the plough referred to.

The Markets.

THE FRUIT TRADE.

Returns of Exports and Imports for the month of July, 1921, for Brisbane only:—

EXPORTS BY RAIL, VIA WALLANGARRA, TO SYDNEY AND MELBOURNE.

TO SYDNEY—

10,773 cases bananas
47 cases oranges
8,083 cases pineapples
606 packages vegetables
517 cases mixed fruits
1,718 trays strawberries

TO MELBOURNE—

28,353 cases bananas
1,006 cases oranges
7,278 cases pineapples
124 cases mixed fruit

EXPORTS BY SEA.

TO SYDNEY—

749 cases bananas
5,877 cases pineapples
329 bags sweet potatoes
350 bags pumpkins
260 cases fruit pulp
4,049 cases canned pineapples
1,213 bags barley
950 bags vegetables

TO MELBOURNE—

926 cases bananas
3,503 cases pineapples
638 cases oranges
70 cases vegetables
88 cases mixed fruits

IMPORTS.

BY SEA—

25,582 cases fruit
8,012 bags potatoes
4,718 bags onions
110 packages plants

BY RAIL—

6,773 cases of fruit
5,993 bags potatoes
217 packages plants

PRODUCTION, PROSPECTS, AND PRICES.

The following market survey is an abridgment of departmental summaries of conditions, prospects, and prices for the month ended 20th August, 1921:—

AGRICULTURE.

The heavy July rains were in many places followed by floods, more or less serious. A period of low temperatures accompanied by heavy westerlies ensued. Frosts were badly needed, particularly in the fruit and wheat areas.

THE MARKETS.

Lucerne Chaff.—Commencing with a poor demand, conditions improved as the first week of the period under review advanced. Sales were effected from 6s. to 8s. 6d., but many lines were passed in at 6s. 3d. to 6s. 6d.

Oaten Chaff.—A fair demand existed for lines from over the Border, but local lines were lifeless. Border supplies sold to 8s. 9d. for prime. Sales of local chaff ranged from 3s. 7d. to 5s.

Mixed Chaff.—Supplies fairly plentiful, but demand weak. Sales were made at 3s., 5s. 4d., 6s. 7d., and 7s. per cwt., whilst many lines were passed in at 4s. 6d., 5s., and 6s. per cwt

Maize.—Supplies were light at the beginning of the first week, but increased later; 4s. 3d. to 4s. 5d. was the range, but many consignments were passed in at 4s. 4d. to 4s. 4½d.

Wheat.—Good feed lines sold to 7s., with inferior grain down to 4s. 3d.

Potatoes.—The demand for good tubers improved, and sales were made at 5s. 9d. to 8s. 3d. per cwt. Many parcels were withheld, business being refused at 4s. 6d. to 6s. 9d.

Sweet Potatoes.—Very few lots came forward. Prime quitted at 3s. 2d. per cwt., and inferior changed hands at 2s. 6d.

Pumpkins.—Demand light. Sales were made at 2s. 3d. to 2s. 9d. Many lines were passed in at 2s., 2s. 3d., and 2s. 6d. per cwt.

Barley.—Only one line was submitted and passed in at 3s.

Broom Millet.—Unchanged. Prime hurl brought £28. Other qualities down to £21 per ton.

In the middle of August the weather was unseasonable, bleak winds being followed by heavy frosts, causing some damage. This, however, was balanced by a check to insect life. Wheat prospects were good. Generally speaking, the agricultural and pastoral outlook in Queensland for the next few months at least is distinctly favourable. Supplies of all classes decreased, and prices rose a little as the result of a dearth of prime lines.

MID-MONTH PRICES.

Lucerne Chaff.—Supplies fair, quality a little inferior. Tht top price was 7s. 11d.; other lines quitted at from 4s. 6d.

Mixed Chaff.—Dull; 4s. 6d. to 6s. 9d.

Oaten Chaff.—Plentiful; demand fair; 3s. to 8s. 9d.

Maize.—Keen competition ruled for prime lines, which were scarce; 4s. 5½d. top price.

Potatoes.—Supplies lighter; improved prices; 6s. to 9s. 4d.

Sweet Potatoes sold at 2s. 9d. to 3s.

Wheat market not overstocked, most lines selling at 3s. 6d. to 6s. 1d.

Malting Barley.—One line passed in at 3s. 3d.

Pumpkins.—Good sales to 2s. 9d. A few parcels realised 3s. 4d.

Broom Millet fetched from £22 to £28 for prime hurl.

Occasional showers followed by cloudless skies marked the last week of the term. Frosts were fairly general. The rain-benefited areas included Northern, Central, coastal districts, and Darling Downs. Lucerne crops were well advanced, and a continuance of fine weather to favour harvesting was looked for. Wheat and other crops were making good growth, and the outlook generally was extremely promising. Increased marketings of all classes of produce were a feature of Roma Street. Prices were good for prime lines. For the week ended 20th August the figures were:—

Lucerne Chaff.—Fairly plentiful, a slight decrease in values; 3s. 9d. to 6s. 7d.

Oaten Chaff.—Border lines again in good demand; 5s. 6d. to 8s. 3d. Local, 5s., 5s. 6d., 6s. 3d.

Mixed Chaff.—3s. 9d. to 6s. 7d.

Wheat.—4s. 9d. to 6s. Demand slackened.

Potatoes.—Supplies increased at the end of the week, and competition, although keen at the commencement, eased off considerably. The bulk of supplies withheld at offers of 5s. 6d. to 8s. 10d. Lines sold realised from 5s. 3d. to 9s. 9d.

Sweet Potatoes.—2s. to 3s. 10d.

Pumpkins.—Demand firm; 2s. 3d. to 4s.

Maize.—Supplies heavy; prices on the up grade; 4s. 6½d. was the best sale; others from 4s. 2½d.

Broom Millet.—Prime £28, inferior down to £20.

DAIRYING.

Statistics for the dairy industry for four weeks ended 20th August include the following:—

Production.—Quantity submitted for examination for cold storage:—Butter, 40,885 boxes (each 56 lb.); cheese, 4,487 crates (each 142 lb.).

This production may be viewed as over and above local requirements and available for export.

Shipments Interstate.—Butter, 11,174 boxes; cheese, 1,024 crates.

Shipments Oversea.—Butter, 30,009 boxes; tinned butter, 109 cases; cheese, 67 crates; luncheon cheese, 4 cases.

In Cold Storage on 20th August, 1921.—Butter, 23,268 boxes (approx.); cheese, 2,669 crates (approx.).

FRUIT.

Weather conditions improved in the course of the first week of the period. The welcome dry change proved beneficial to the coming crops. Spring planting preparations were also facilitated, and a further dry spell will make for good burns in the scrub areas. Pruning and winter cultivation were the main activities in orchards and vineyards. Quantities of citrus fruits, bananas, and pineapples were coming on to the market, all of generally good quality. The demand was fair, but prices were lower than those ruling at the corresponding period of last year.

In the second week of the term fine dry days, with cold strong westerlies, had the effect of drying saturated surfaces and allowing growers of temperate fruits to proceed with spraying and pruning. Fresh planting areas were also in course of preparation in many localities. Pineapples, citrus fruits, bananas, strawberries, papaws, and cape gooseberries made up the full range of offerings. A limited number of pines were packed, and the finished product is of high quality.

Show week was remarkable for almost perfect weather. Light frosts caused some damage in exposed situations. At the Show was seen one of the finest displays of citrus varieties and other seasonable fruits ever assembled in Queensland. The Southern Queensland Fruitgrowers' Society, Limited, which represents no fewer than sixty-two individual associations, had a magnificent exhibit. The Returned Soldiers and Sailors Co-operative Fruitgrowers' Association, whose headquarters are at Woombye, also displayed a very fine trophy.

In the course of the week ended 20th August rising temperatures betokened an early spring. On the coast, vines had started growth, and vignerons had commenced spraying to prevent mildew and black spot. The preparation of country for pineapples and bananas was proceeding satisfactorily, and on the scrub areas early burns were anticipated. Very heavy crops of strawberries were coming on to the market. Berries of exceptional quality were the rule. The question of the disposal of strawberry pulp is now under consideration and, should a trial shipment be made with satisfactory results, another important step towards payable treatment of glut crops will have been taken. Bananas and pines are still coming forward in quantity and good quality. Pines are still (at the date of writing) being treated at the State and other canneries, and the quality of the output is high. The present pack is regarded as the best so far put up in the State, and that it is even better than last summer's canning.

FAT STOCK.

REPORT FOR WEEK ENDED 20TH AUGUST.

Cattle.—1,040 yarded. The general quality of the yarding was below average. Only a few lines of trade bullocks up to standard were offered. Cows made up a good proportion of the yarding, and sold well. The market generally was better than that of the previous week, and the closing sales were decidedly firmer. Best bullock beef quitted at from 24s. to 28s., good bullocks 21s. to 23s. 6d., and cows 20s.

Sheep.—About 8,400 sheep were penned, including several trainloads from the Central and Western districts. The quality was mixed, and a good number of stores were included in the offerings. All round, the market was about equal to that of the previous week, prime sheep selling to 3½d. per lb., and good trade mutton to 3d. per lb.

Orchard Notes for October.

THE COAST DISTRICTS.

October is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised, as, unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied with same. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of these spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitious plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such diseases as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season, the subsequent crops of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of "The Coast Districts" applies equally to these parts of the State, as on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruits are grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful watch should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruits, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil

spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm and Garden Notes for October.

Field.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, sorghum, setaria, imphee, panicum, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants, from preparing the ground to harvesting the crop, to which our readers are referred.

Kitchen Garden.—Our notes for this month will not vary much from those for September. Sowings may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 ft. apart with 18 in. between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomato plants planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. See our instructions in "Market Gardening," obtainable on application to the Under Secretary, Department of Agriculture and Stock. Rosella seeds may be sown this month. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

Flower Garden.—The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant tuberose, crinum, ismene, amaryllis, pancratium, hermocallis, hippeastrum, dahlias, &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphis, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	September.		October.		November.		December.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6 8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6 9	4·46	6·31
7	5·57	5 36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5 54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6 13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	3·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5 40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6·22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H. M.
2 Sept.	●	New Moon	1 33 p.m.
9 ,,	☾	First Quarter	1 30 p.m.
17 ,,	○	Full Moon	5 20 p.m.
25 ,,	☽	Last Quarter	7 18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10 26 p.m.
9 ,,	☾	First Quarter	6 12 a.m.
17 ,,	○	Full Moon	9 0 a.m.
24 ,,	☽	Last Quarter	2 32 p.m.
31 ,,	●	New Moon	9 39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1 54 a.m.
15 ,,	○	Full Moon	11 39 p.m.
22 ,,	☽	Last Quarter	9 41 p.m.
29 ,,	●	New Moon	11 26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11 20 p.m.
15 ,,	○	Full Moon	12 50 p.m.
22 ,,	☽	Last Quarter	5 54 a.m.
29 ,,	●	New Moon	3 39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Agriculture.

COTTON SEED AS STOCK FOOD.

By J. C. BRÜNNICH.

In the August number of this Journal the Principal of the Queensland Agricultural College dealt with the economic aspect of the utilisation of cotton seed as a food for cattle, and the importance of such utilisation becomes very apparent when we consider that for each pound of cotton fibre or lint produced there are at least 2 lb. of seed.

In the July number appeared a short notice on "Cotton Seed for Sale," and an analysis of cotton seed meal was given, which is the analysis of a very choice decorticated cotton-seed meal, and was followed by the remark that cotton seed after reduction to the form of meal is richer than cotton-seed meal. This statement is not correct and, as a matter of fact, ground cotton seed will have less than half the feeding value.

Ground cotton seed should unquestionably be utilised as cattle food and, if used with discretion, will give good results. Therefore, such use is quite justified until larger quantities of seed are produced, which would make the proper treatment of the seed practicable. The only correct method for the utilisation of cotton seed as food is after decortication and extraction of the oil, on account of the great value of the oil and the well-established fact that cotton-seed meal gives far better results as a cattle food than ground cotton seed.

Henry and Morrison, in their standard work, "Feeds and Feeding," state:—

"The practice of feeding cotton seed to beef cattle in the South is rapidly declining, according to Soule, of the Georgia Station, both because of the demand for the seed for oil production and because cotton-seed meal gives uniformly better results than the whole seed."

In a feeding trial at the Texas Station it was found that 4 lb. of cotton seed substituted for 1.9 lb. of cotton-seed meal produced smaller gain of live weight, and that cotton-seed meal at 26 dollars per ton was cheaper than cotton seed at 12 dollars.

The hard, leathery shells, or hulls, of the cotton seed have practically no feeding value, and are passed by the animals in undigested form. Even when ground very fine the digestibility of the hulls is but little increased, and ground hulls have less

feeding value than straw or corn stover. In many cases the accumulation of a compact mass of undigested hulls in the bowels has caused serious troubles and death. The first observation on so-called cotton-cake poisoning, following the used of undecorticated cotton cake, was made by A. Voelcker, in 1859, and reported in the "Veterinarian." The post-mortem examination of the animal showed the duodenum blocked by 72 lb. of comminuted and densely impacted hulls.

The occasional fatalities caused by such balling or impaction of the hulls do not, however, explain the numerous cases of ill-effects reported from time to time, but show distinctly the necessity of removing a large portion of the hulls from the crushed seed, and the advantages of using decorticated meal. But even decorticated cotton-seed meal cannot always be safely used, and the mere fact that nobody recommends its use for young calves, lambs, swine, and cows heavy in calf, shows that discretion is always necessary when using this highly concentrated food.

Henry and Morrison (*ibid.*) state:—

> "Numerous efforts have been made during the past twenty years to determined the cause of the poisonous effects of cotton-seed meal. The harm has been variously ascribed to the lint, the oil, the high protein content, to a poisonous albumin or alkaloid, to choline and betaine, to resin present in the meal, to decomposition products, and to salts of pyrophosphoric acid. Further work shows that the poisonous effects are not due to any of these causes."

It may be safely assumed, however, that the proteins in the cotton-seed meal, present in such large amounts, when fed to young animals, or animals already suffering from slight digestive troubles, or when being mixed with other unsuitable fodder, are not readily and properly peptonized by the digestive fluids, but micro-organisms gain the upper hand and form poisonous ptomains. It is well known that choline and betaine, in itself very slightly poisonous, are always found in cotton-seed meal, and that the former changes readily into the much more poisonous neurine.

A very complete summary of the many theories advanced up to the present time by many investigators on the probable causes of injuries due to cotton-seed meal is given by Icie J. Macy in "Historical Notes on Cotton Seed as Food" ("Journal of Dairy Science," May, 1921):—

> "In 1915 two theories arose:—Firstly, that cotton-seed meal poisoning is a deficiency disease, as set forth by Rommel and Vedder (1915) and later supported by Wells and Ewing (1916); secondly, that it is due to a definite phenolic compound (gossypol) found in cotton-seed meal as shown by Withers and Carruth (1915).
>
> "The results of investigators in their studies of cotton-seed foods are not constant, owing in part to the notable variations in effects upon live stock. Even animals of the same species respond at different times with unlike symptoms, although they consume similar quantities of the same food. Other difficulties are encountered. The degree of toxicity of cotton seed depends on the variety of seed and upon the climate and soil in which they are grown. And again, the meal made from the kernels is greatly altered by the treatment in the process of manufacture. There is uncertainty as to the degree of the responsibility of gossypol for the toxicity, as results of investigators differ. All such factors lend difficulty to the study of the effects of cotton-seed foods and render the present status of the problem uncertain."

All these remarks point to the fact that one must be cautious when feeding stock with cotton seed or its products. Fresh, well-cleaned decorticated meal is unquestionably an excellent, highly nutritious food for cattle, but should not be given in quantities exceeding 4 lb. per head of 1,000 lb. live weight. Young calves, lambs, pigs, and cows within four weeks of calving should not get any cotton-seed meal.

In order to ascertain the actual food value of our Queensland-grown cotton seed, samples were obtained from our departmental store, and short lint, hulls, and kernels were carefully separated and analysed.

The actual amounts obtained agree very closely with the yields obtained elsewhere.

According to Burkett and Poe, 1 ton of cotton seed yields—

Linters or short fibre ..	27 lb. or 1.4 per cent.	$\left.\right\}$ 43. 4 per cent.
Hulls	841 lb. or 42.0 per cent.	
Cake or meal	732 lb. or 36.6 per cent.	
Crude oil	280 lb. or 14.0 per cent.	
Loss, &c.	120 lb. or 6.0 per cent.	
	2,000 lb. or 100.0 per cent.	

We actually obtained from our own seed 10.5 per cent. of short lint, 31.3 per cent. of hull, or 41.8 per cent. lint and hull, and 58.2 per cent. kernel.

At the same time a larger quantity of seed was treated by one of our local firms, and, after crushing the seed, as much as possible of the hulls was sifted out. From 2 tons of seed about 1 ton of meal was obtained, but as the cost of treatment, crushing, and sieving amounts to £2 per ton, the cost of this meal would be £9 per ton if the seed is £3 10s. a ton.

The analysis of this meal is given below, and I believe that in this form the bulk of our cotton seed should be utilised at present as cattle food, until larger quantities of seeds produced would warrant the establishment of an oil-extracting plant, as by the extraction of the oil the protein percentage of the meal is considerably increased.

ANALYSIS OF:

—	Lint.	Shell.	Kernel.	Whole Seed.	Sifted Whole Seed Meal.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	7·83	12·10	7·15	8·8	7·59
Crude protein	2·50	3·06	36·44	22·4	34·00
Crude fat	0·61	0·37	29·11	17 1	28·22
Nitr. free extract	14·65	60·03	18·27	31·0	14·95
Crude fibre	72·50	21·11	4·03	16·6	9·24
Crude ash	1·91	3·33	5·00	4·1	6·00

In order to ascertain the actual unit value of the food and to compare it with other commercial concentrated foods, in the same manner as it was done for calf foods ("Queensland Agricultural Journal," March, 1919), the total number of food units is ascertained by multiplying percentages of digestible proteins and fat by 2½, and adding the percentage of other digestible carbohydrates, or nitrogen-free extract, and digestible fibre. These units divided into the price per ton gives the price per unit:—

COST OF FOODS.

—	Digestible Nutrients.				Food Units.	Cost per ton.	Cost per Unit.
	Protein.	Fat.	Carbohydrates or Nitr. free Ext.	Fibre.			
	%	%	%	%	%	£ s. d.	s. d.
Cotton seed	15·2	14·9	15·5	12·6	103·4	3 10 0	0 9
Sifted Cotton seed meal ..	23·1	24·5	7·5	7·0	133·6	9 0 0	1 4
Prime decortated Cotton-seed meal	37·0	8·6	21·8		135·8	..	..
Linseed meal	19·9	10·4	27·6	5·5	108·8	16 0 0	2 11
Sunlight Oilcake ..	12·9	8·4	36·3	7·3	96·7	15 0 0	3 1
Maizemeal	7·4	3·0	62·8	3·0	91·8	15 0 0	3 3
Bran	11·4	3·8	41·6	2·2	81·8	8 10 0	2 0
Pollard	12·4	4·2	46·0	2·0	89·5	8 10 0	1 11

The table clearly shows that cotton seed is the cheapest concentrated food obtainable at present, more particularly in comparison with linseed meal and oilcake which, only two years ago, were some of our cheapest concentrated foods, but have since enormously increased in cost. Pollard is still a reasonably cheap concentrate. Some of the prices are hard to explain. Why should maizemeal be £15 per ton, when maize costs only about £9?

Although feed is plentiful just now, farmers are strongly advised to secure their share of the cotton seed to supplement the ration of their dairy stock with reasonable amounts of this highly nutritious food. The increased yield and better quality of the milk will return a good profit for the extra outlay, and show the value of systematic feeding of all stock.

WINTER FEEDS ON THE ATHERTON TABLELAND.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, has received the following report (dated 10th September, 1921) from Field Assistant F. J. S. Wise on winter green feed trials at Mr. Robert Campbell's farm, Peeramon:—

"Though the wet season had provided sufficient natural feed for most dairymen's requirements, the full benefit of a winter crop, even sown early, would, by subdivision of paddocks, be felt in any year. The profits would be immediate, showing in the increased cream returns, and the cattle would be kept in a state of health and vigour, conducive to heavy production. An area of a few acres of well-planned crops would be sufficient to tide most tableland dairymen over the lean months.

"The whole of this crop could have been converted into valuable hay if harvested late in July, as fine weather prevailed for the purpose, but it is feared, now that drizzly weather has started, that portion of the crop may be spoiled. As a hay proposition, the southern portion of the tableland is uncertain, but the crops included in the trial, on the farm of Mr. Campbell, as green fodder leave little to be desired. As our last year's trials at Tarzali were the means of many small areas being planted, it is to be hoped that the activities of the Department will be again marked by the increase of many winter fodder areas in the dairying districts.

"As the later trials have only recently been planted, some months must elapse before other results become available.

"NEW SCRUB LAND UNDER GRASS FOR SEVERAL YEARS.

"*Ploughed early in April. Sown* 22*nd April,* 1921. *Yields taken* 3*rd August,* 1921. *Area,* 3 *acres.*

"*Plot* 1—*Blue Field Peas.*—This old standard pea was very encouraging in growth throughout, and produced a solid mass of fodder. Yield green stuff (pods well set), 8 tons per acre.

"*Plot* 2—*Grey Field Peas.*—As was the case with this variety in trial last year, the growth was excellent; in fact, it is doubtful whether field peas ever grew better. Personally, I have not seen anything to come near them. The very heavy growth of succulent fodder would be sufficient inducement for all farmers in the dairying districts to supplement their supplies with this excellent legume. Though broadcasted at the rate of 25 lb. per acre, the vines completely covered the ground, and specimens have been secured over 8 ft. in length. The yield was equal to 15 tons per acre in a medium portion of the crop, and much heavier in places.

"*Plot* 3—*Golden Vetches.*—After the experiment with this crop last season it will be remembered that I was strong in the praise of it (refer to report dated 14th September, 1920). This season, when sown alone at the rate of 30 lb. per acre, the crop made one dense mass on the ground, and though yielding well, owing to its creeping habit, requires a strong cereal to support it. A crop worthy of more attention than is at present given. Yield, 8 tons per acre.

"*Plot* 4—*Golden Vetches combined with Bunge Wheat.*—This combination is undoubtedly an excellent one. The wheat was sown at the rate of ½ bushel to the acre, but it would be an advantage to increase this quantity. The vetches doubtless increase the value of the basic crop, and even if fed off would do much to assist the dairymen in keeping up supplies and improving their soil. The yield was high, and samples of the vetches grew 4 ft. up the cereal. Yield, 14½ tons.

"*Plot* 5—*Bunge Wheat.*—Excellent growth was maintained throughout by this variety and, in spite of the heavy wet, showed little sign of rust. As a green fodder it deserves a lot of attention in this district. Yield, 8 tons per acre. Flag very heavy.

"*Plot* 6—*Amby Wheat.*—Though not yielding the quantity in bulk of green stuff when compared with Bunge, this variety has many admirable features and may, possibly in the wetter areas, be a surer crop. Yield, 6½ tons.

"*Plot* 7—*Warren Wheat.*—As was anticipated, this variety would prove a top-notcher as a wheat for green fodder in our dairying centres. At about two and a-half months a wonderful bulk of green feed was in evidence, and up to earing stage the flag was almost unaffected by rust. It would be a risky crop for hay, as the heavy growth of the plant would not be sustained as moisture began to peter out. It should do well grazed off at about two months and then allowed to grow for a final yield of green fodder. Yield, 9½ tons.

"*Plot* 8—*Florence Wheat.*—This good old variety would be a more certain crop on the tableland than perhaps any other wheat, but in a wet season, as the one in which this test has been conducted, the value of the later wheats and their heavy growth is very marked. In a dry season, however, the tables would be turned, and where Florence would be a 'certain something,' a variety such as Warren may be a dead loss. Owing to its being very mature, this variety weighed light at time of tests for green fodder weight, yielding 5½ tons.

"The time of harvest was very opportune for wheat varieties Bunge and Warren to weigh well, the latter especially was at its heaviest stage, just breaking into ear, whereas Florence was almost ripening off. The combination of wheat and vetches has again proved to be one of the most valuable farmers could produce on the tableland, as a great mass of succulent fodder resulted. The wheats were sown at the rate of 1 bushel per acre, and in most tableland soils, especially with a sparse stooler as Florence, could be increased 50 per cent. with advantage. The rain during the growing period was 18 in., which is heavier than usual, but an average of the last six years for the period this crop occupied the land is 10.25 in., so that this year's results could be proportionately obtained in almost any year.

"The big argument for the success of these trials at Peeramon rests on the fact that a heavy crop of maize was cut for silage in March, the land being afterwards immediately ploughed for the reception of the seed for the second crop."

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

By H. I. JENSEN, D.Sc. (Syd.).

I.

INTRODUCTION.

It has been known for ages that many forest trees have a special predilection for certain kinds of soil, and as the science of geology has developed it has been noticed by field geologists in all parts of the world that certain trees are almost entirely confined to certain geological formations. So definite is the dependence of some plant species on a particular rock type that these plants can be used in field mapping as safe indications as to the formation beneath the soil on which they grow.

The study of forests in relation to soils and geological formations has attained high scientific development in countries like France and Denmark, where reafforestation is a matter of great national importance. The relation between forest trees and geological formations here in Australia has been repeatedly referred to and discussed in scientific writings and reports by J. H. Maiden, F.R.S. (Government Botanist of N.S.W.), and R. H. Cambage (now Under Secretary for Mines, N.S.W.), E. C. Andrews, B.A. (Chief Geologist, N.S.W.), and the writer as well as many others.

The writer is not a botanist, but he has endeavoured to get a working knowledge of the timbers of every area he has investigated as geologist or soil surveyor in the Northern Territory, Queensland, and New South Wales, by collecting botanical specimens and having them diagnosed by men like Mr. J. H. Maiden or Mr. C. T. White, who are specialists in the science of botany.

The writer has outlined the relationship of soils to the underlying geological formations and also the principles which govern the dependence of forest flora on geological formation, in a series of articles in the "N.S.W. Agricultural Gazette," during the years 1908-1912, when he was carrying out soil survey work in New South Wales. These investigations were published in text-book form by the Agricultural Department of New South Wales in "Soils of New South Wales" (Government Printer, Sydney. Price, 5s.).

A brief summary of the conclusions arrived at by extensive surveys, accompanied by thousands of soil analyses, in New South Wales, is desirable at the outset of this series of articles.

It was found that the character and quality of soils were dependent principally on geological formation, secondarily upon climate and topography. Topography is, however, as a rule itself dependent on geological formation and climate, and is therefore a factor of minor importance as compared with geology and climate.

Thus in coastal regions and inland regions alike, soils can be divided into geological groups which stand in the same relation to one another, as for instance—

Granite Sandstone Quartz schist	Sandy light loams relatively poor in mineral plant-food.
Trachyte Andesite Shale	Loams, fair in plant-food.
Diorite Basalt Calcareous sandstone Calcareous shale Limestone	Clayey soils rich in plant-food.

But, although coastal basalt or limestone soil type is very high in plant-food as compared with a coastal sandstone or granite soil type, a typical inland sandstone soil may carry more soluble plant-food than the coastal typical basalt soil, without the relative order of richness in plant-food for the various groups being interfered with. This is due to the leaching which coastal soils (wetter climate soils) undergo as compared with inland soils.

Just as chemical plant-food in a soil depends on geological formation so does soil texture, and climate affects soil texture as well. However, a clayey basalt soil in a wet climate is very good agricultural country, while in a dry climate it is not infrequently unsuited for cultivation on account of its stiffness and alkalinity. It is therefore apparent that soil analysis is not by any means a reliable guide to the agricultural value of a soil. Many a soil which gives an analysis very poor in mineral plant-food contents is a soil of high fertility, owing to the underlying geological formation by its gradual disintegration supplying the plant-food ingredients as speedily as the plants can use them. The poverty of the soil under analysis is, in such cases, due to its being a leached soil. For instance, the granite soils on the hill slopes around Stanthorpe seem, on analysis, to be very poor in plant-food. They are deficient in lime, potash, and phosphate, at least in an available form. Yet that country has in many places supported orchards for over thirty years without any manure being given, and it is safe to say that in some cases more potash—many times more potash—has been removed from the ground in fruit, seeds of fruit, and prunings than the soil showed to be present when analysed. Where did this surplus potash come from? It came out of the decomposing minerals of the underlying granite. As fast as these soluble plant-foods get out of the granite minerals into the soil water they are either made use of by plants or leached away. We can also fix them in the soil by increasing the quantity of humus in the soil, for humic acids combine with the mineral substances, forming less soluble compounds.

Hence, where we have a geological formation which, like dioritic granite, liberates much potash, lime, and phosphate, in its decomposition overlain by a leached hungry soil, we can improve that soil in potash, lime, and phosphate without adding any of these substances but simply by increasing the amount of humus in the soil with catch crops, &c. But when the formation below the sandy leached soil is silicious granite or sandstone, very little mineral plant-food gets liberated through rock disintegration, and these substances must be added in the form of artificial manure.

When this is fully comprehended, it is easily seen how deceiving soil analyses are when the geological formation and conditions of occurrence of the soil are not known to the analyst.

It therefore follows that a geological examination of an area is a better guide to the farmer than soil analyses unaccompanied by field inspection, so long as the geologist understands the principles of soil chemistry.

When the writer commenced his researches on soils he was hopefully working under the delusion that soil analysis by itself could be made the basis of soil classification. Little by little the hope was shattered, although various methods of analysis, such as the hydrochloric, the citric, and the water soluble methods were tried.

The researches, however, did establish the fact that the bushman's method of judging soil by the timber growing on it was thoroughly sound in principle.

It therefore follows that notes made on soils and the timbers growing on them may be very useful to intending agriculturists, and are consequently offered for what they are worth. It may be stated that the determination of the plants has been made by Mr. C. T. White, Government Botanist of Queensland, to whom the writer owes his sincerest thanks.

It will be best to consider the subject under discussion geographically under the headings—

1. Roma to Injune.
2. The Maranoa Valley.
3. The head of the Warrego.
4. The tributaries of the Nogoa.
5. The tributaries of the Brown.
6. Westgrove and Glenhaughton, Taroom.
7. The Drummond Range.
8. Tables of vegetation.

ROMA TO INJUNE.

The soils are predominantly good in chemical plant-food constituents and somewhat variable in texture. However, there are belts of rather poor sandy soil at intervals, corresponding to outcrops of white sandstone, but these do not constitute any large area.

The country traversed can be divided into—

(*a*) Open plains.
(*b*) Brigalow scrub and brigalow-belar scrub.
(*c*) Belar-wilga scrub.
(*d*) Sandalwood country.
(*e*) Box country.
(*f*) Ironbark country.
(*g*) Pine country.
(*h*) Moreton Bay ash and sugar-gum country.
(*i*) Basaltic box lands.
(*j*) Gilgai country.

Open Plains.—Treeless plains invariably occur on heavy black soil of a highly calcareous nature. It is sometimes of basaltic nature, as on the Darling Downs, but more often of limestone or calcareous shale derivation in the area under review. Such black soils usually expand enormously on wetting, and this feature is by many considered responsible for the absence of trees on them. It is argued that formation of huge cracks in dry weather, the hummocking up of the soil by expansion in wet weather, interfere so much with the roots of trees that tree growth cannot take place.

However, a more likely cause of the open plain is the presence in the soil of alkali or other soluble salts detrimental to the germination of seeds of forest trees. It is known that brigalow frequently supersedes open plain, and that where a brigalow thicket dies out we sometimes get a plain. Brigalow can stand more alkali than other plants, and therefore casts some light on the problem.

An efflorescence of ''white alkali'' (sulphate of soda) is often met with in pockets on these plains, and over some areas gypsum (sulphate of lime) is exceedingly plentiful in the soil. The white alkali is more often seen on the basalt plains and the gypsum on the rolling downs or cretaceous marine limestone. White alkali and gypsum are very different substances, but either can be present in such excess as to hinder germination. This accounts for the fact that a very heavy rain, which thoroughly leaches all the soluble salts out of the ground, is necessary to germinate the grass seeds on the black soil plain.

The stiffness of black soil plain is due mainly to ''black alkali'' (carbonate of soda) which is not only detrimental to the texture of the soil but is also a plant poison. This may be present to the extent of .05 per cent., and the problem of cultivating black soil plain hinges on the difficulty of destroying this salt cheaply and effectively. Mr. Symmonds's scheme of applying nitric acid would be very good if nitric acid were cheap enough. In chemical plant-foods the black soils are very rich, as may be gauged from the following anaylses by the hydrochloric acid method:—

	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
	%	%	%	%	%	%
Namoi, N.S.W., black soil (average) ..	5·45	6·36	·099	·680	·390	·201
Castlereagh River, N.S.W. (average) ..	4·82	7·95	·110	·476	·264	·154
Moree, N.S.W. (average)	7·04	5·83	·066	·714	·286	·092

These soils are, roughly, seven times as rich in mineral plant-food as fairly good sandstone soils.

When a hill occurs in black-soil plain country, we find the black soil passing into chocolate loam on the slope, and here we get a sprinkling of forest trees. The soil of such hills is not nearly so rich in plant-food, being more leached, but, owing to the carbonate of soda being leached out first, it is more fertile.

The trees on the fringe of blacksoil plains are brigalow (*Acacia harpophylla*), emu apple (*Owenia acidula*), box (*Eucalyptus populifolia*), sandalwood (*Eremophila Mitchelli*).

Open plains are characteristic of the calcareous shales and limestones of the cretaceous (rolling downs), but occur also in patches in the brigalow belt of the Lower Walloon calcareous shales at Injune Creek and Mount Hutton.

Brigalow Scrubs.—These occur on the same or a very similar soil type as the open plains, namely—heavy, black, clay soils rich in plant-food but also rich in the detrimental alkali. When cleared they form as excellent grasslands as the blacksoil plains, but they contain the same defects from the agricultural point of view. If heavy rain follows a bush fire on the brigalow outskirts of blacksoil plains, the brigalow tends to spread over the plain, but when fires are not followed by rain the plain spreads at the expense of the brigalow, except where the prickly-pear saves the brigalow, as is the general rule to-day. Like other wattles, the brigalow needs a bush fire to crack the seeds in order that they may germinate. Brigalow and box also change places at intervals. If a brigalow belt which is not heavily charged with alkali gets destroyed under unfavourable conditions for the germination of the seed, box (*Eucalyptus populifolia*) may replace the brigalow. On the other hand, if a bax flat has its drainage interfered with so as to accumulate alkali on the flat, the box will get replaced by brigalow.

Brigalow and Prickly-pear.—It is a most noticeable fact that the prickly-pear everywhere enters into close partnership with brigalow. Eventually by checking bush fires it will kill out the brigalow. The brigalow soils are ideal for prickly-pear, and the shade of the brigalow offers shelter to the pear from the direct rays of the sun. It is hardly to be doubted that the prickly-pear is a lover of saline land, especially rich saline land. This fact came under the writer's notice through a walk along the beach from Sandgate to Cribb Island. We find prickly-pear in various places along the foreshores of Deception Bay, where seaspray is carried over the land, and back from the sea over areas which have been only recently salt marshes or arms of the sea. The pear does not spread back over the leached soils of the higher lands, because these soils contain no salts. With a view of testing this explanation, the writer collected three type soils—

No. 460.—Typical brigalow soil with dense pear spreading fast, 40 miles north of Roma-Durham Downs road.

No. 461.—Typical belah soil, with some pear, healthy but not spreading as fast as in the brigalow. Same road, 30 miles north of Roma.

No. 462.—Typical box soil. Some pear, but not healthy. 35 miles north-west of Roma, on Cornwall Station.

[TO BE CONTINUED.]

THE DISSEMINATION OF INTRODUCED PASTURE GRASSES IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Instructor in Agriculture.

That the continued prosperity of this State is to a large extent dependent upon our pastures is only too evident when we look at the trainloads of fat stock in transit to the various meatworks and large centres of population, the huge consignments of wool *en route* to ports for shipment overseas, and the returns from our butter and cheese factories.

In view of the fact that our grasses are such a valuable asset, it is somewhat surprising that so little attention has been given, more particularly by pastoralists, to their habits and characteristics. Even the testing of high quality indigenous varieties in areas where the more inferior sorts predominate would be a work of immense value and importance.

While dairy and other farmers are equally indifferent as to the merits of our native grasses, they must be credited with giving introduced varieties a fair amount of attention. It will be found that all those of any importance suitable to sub-tropical conditions will be met with in practically every locality in the coastal areas of Central Queensland. In all probability it would be a difficult matter to find a farm that has been under occupation for a few years upon which there are not two or three introduced varieties growing. Even in the cities they are well represented. In Rockhampton a collection can be secured on practically every allotment. The following is a list of those growing in my own backyard, all as far as I know having found their way there by natural agencies:—*Paspalum dilatatum*, Rhodes grass (*Chloris gayana*), *Chloris virgata*, *Chloris barbata*, Guinea grass (*Panicum maximum*), giant couch grass (*Panicum muticum*) red Natal grass (*Tricholæna rosea*), prairie grass (*Bromus uniloides*), and buffalo grass (*Stenotaphrum americanum*).

The actual area of pastures in Central Queensland sown down with introduced grasses is somewhat difficult to estimate, but in all probability it would be in the vicinity of 40,000 acres.

The notes hereunder will give some idea as to the distribution of the respective varieties.

RHODES GRASS (*CHLORIS GAYANA*).

Of the area under introduced grasses in Central Queensland, this variety would undoubtedly claim 95 per cent. When paspalum was boomed some twenty years ago, it found its way on to practically every farm, being invariably sown among the indigenous growths. The extensive areas of scrub country existing at Mount Larcom, Barmoya, Dawson Valley, and other places had not then been opened up. In the course of recent years thousands of acres of scrub have disappeared, and in its place are waving fields of succulent Rhodes grass. To the scrub settler this grass has several points in its favour. For example, the cost of seeding an acre is little more than the labour of sowing the seed. No covering is required, germination is invariably good, and subsequent growth rapid; in fact, it is generally too rapid, the average settler finding a difficulty in keeping it from growing rank and running to seed. To say that 50 per cent. of the material is wasted during the first three years after being seeded down would be a very conservative statement. A commencement has, however, been made to harvest this grass for hay, more particularly in the Mount Larcom and Barmoya districts.

Rhodes grass is undoubtedly a great drought-resister. Instances have been noted where it has practically disappeared during prolonged droughts, but this was evidently due to overstocking, adjacent paddocks not so heavily grazed not being affected.

PASPALUM DILATATUM.

Although occasional paddocks are met with, most of the paspalum grown is to be found in low-lying situations as a mixture among the native sorts. It is really only suitable for coastal localities enjoying a heavy and well-distributed rainfall. Given those conditions, it is undoubtedly of great value to the dairy farmer, but for fattening purposes it does not find much favour.

GIANT COUCH OR PARA GRASS (*PANICUM MUTICUM*).

This grass is well distributed throughout the Central District, but individual areas are by no means extensive. That it is not more largely grown is not through any lack of recognition of its value, but more as a result of the difficulty and expense entailed in establishing it on a large scale. It is not only a very shy seeder, but the seeds shatter as soon as they mature; therefore, propagation has to be carried out by means of cuttings or roots. One of the quickest methods of establishing it is to run the long shoots through a chaffcutter, using only one knife, and the long cut. The resultant cuttings are then distributed in a furrow and covered lightly. Being susceptible to frost, this grass is only suitable for coastal areas. It is one of the best varieties for growing along the banks of creeks, binding embankments, &c. It will also withstand submerging for some time, and salt water does not seem to harm it, as it is to be found growing on the banks of the Fitzroy, where the tidal waters cover it occasionally. As a result of its luxuriant habit of growth, it will smother out nut grass and other noxious weeds, including even prickly-pear. Although coarse, it makes a very good chaff for home consumption, a peculiar characteristic being that it will retain its succulence to such an extent when stacked away as a cured hay that when cut into chaff it will ferment in the bag.

CHLORIS VIRGATA (No Common Name).

Isolated patches of Virgata are to be met with in most of the Rhodes grass areas, but, being less aggressive than the Gayana, it is not likely to become at all prominent. It has a more upright habit of growth, and does not send out surface running shoots so freely as the common Rhodes. It can be distinguished by its lighter inflorescence, while the seed head does not open up and assume the characteristic star shape of most varieties of the Chloris family. No effort has been made to establish it as a separate variety on a large scale.

A variety of Chloris, known as the "Australian Rhodes Grass" (*C. barbata*) although not credited with being an introduction, was rarely met with in the coastal areas until a few years ago. In the Journal of February, 1912, the writer made reference to this grass as having made it appearance in the Charters Towers district. As a result of the remarks made, seed was obtained from that centre and grown in many localities where it had not hitherto made its appearance. In the recently cleared scrub lands, more particularly at Mount Larcom and the Dawson Valley, fairly considerable areas of *barbata* are in existence. It is also becoming a prominent feature along the various railway lines, notably at Ambrose, North Coast Line. It makes its appearance early in the spring, but, being more of a surface-rooter, it is less drought-resistant than ordinary Rhodes grass. A heavy seeder, it will establish itself very quickly on any bare patches of land adjacent to where it is growing. It has a high nutritive value and is relished by stock.

GUINEA GRASS (*PANICUM MAXIMUM*).

Isolated patches of this grass are to be met with on most of the farms along the coast. Although it seeds very freely and germinates readily, it is not likely to become

a useful pasture grass, for the simple reason that it will not stand grazing. At many places on the railway line between Cairns and the range this grass had at one time practically taken possession. Although 6 to 8 ft. high inside the fences, outside in the adjacent paddocks not a plant was to be seen. It provides a large amount of green succulent material, but it has to be cut before it reaches the seeding stage, otherwise it gets very hard and wiry.

PRAIRIE GRASS (*BROMUS UNILOIDES*).

Repeated attempts have been made by dairy farmers to grow this useful winter grass, but results have not been of a very promising nature. Prairie requires a fair amount of moisture, and as the winters in the Central district are invariably dry, the future for this variety is not very encouraging.

CANARY GRASS (*PHALARIS BULBOSA*).

This winter variety has been tried in various parts of the Central district, but, so far, little enthusiasm has been shown over its introduction. This is mainly on account of two important requirements, namely—winter moisture and the attention practically of a cultivated crop.

RED NATAL GRASS (*TRICHOLŒNA ROSEA*).

According to records, this grass was introduced into Queensland as an ornamental variety as far back as 1876. Tests in regard to its value as pasture were carried out at Mackay and other northern districts twenty-five years ago. They were not too favourable, for while producing a large amount of fodder it was found to be more or less of an annual. Since that time its distribution has largely been by natural agencies, its first appearance in a district being invariably along the railway line. Although a strong grower, it is by no means aggressive, and will rarely establish itself among other sorts. On bare ground, or on vacant cultivated land, the wind-carried seeds germinate readily, and given favourable climatic conditions, subsequent growth will be exceedingly rapid. This invasion is often a distinct advantage as, for instance, in scrub areas where a poor germination has been secured of Rhodes grass, red Natal will take possession of the bare patches, which otherwise would become overrun with weeds and undergrowth. Its wind-carried seeds makes it more or less of a pest if growing adjacent to cultivated areas. Frost cuts it down, but, owing to mild climatic conditions, it has continued to bloom right throughout the present winter. In some of the cleared scrub areas, red Natal has become quite a feature of the landscape. Although the area under paspalum is difficult to estimate, even approximately, yet in all probability red Natal would more than equal it, and thus take second place to Rhodes.

BUFFALO GRASS (*STENOTAPHRUM AMERICANUM*).

Small areas of buffalo are to be met with throughout the Central district, but on account of its coarse nature there has not been any attempt to establish it as a pasture. Stock are invariably to be found grazing on it early in the morning while wet with dew. I have been informed by bullock-drivers engaged in the timber industry in the Cooroy district that their teams do well on this grass, preferring it to the more succulent paspalum.

KIKUYU (*PENNISETUM LONGISTYLUM*).

This variety has not so far been grown to any extent, having only been introduced to Australia in 1919. It promises, by its habit of growth, to be a valuable addition to the list of introduced sorts. It has not yet exhibited any signs of seeding, and, as propagation will have to be carried out by cuttings, its distribution on an extensive scale is not likely to be rapid.

RESULTS OF THE JUVENILE CORN-GROWING COMPETITION, 1920-21.

Owing to various causes, principally the dry period experienced in February, only seventy-two out of the original 156 entrants complied with the conditions of the competition.

The quality of the cobs forwarded from most districts may, on the whole, be regarded as highly satisfactory; some, however, showed lack of type character and uniformity. Shelling percentages were generally very satisfactory, reaching as high as 87.93, whilst only two competitors sent cobs giving less than 80 per cent.

Owing to the increased number of competitors and a somewhat irregular season, the average yield for the whole competition was slightly under that of the previous year, and works out at 52.24 bushels per acre. The highest yield was obtained in the Alberton (South Coast) district, where 122.2 bushels per acre were obtained.

The following are the tabled results of actual yields of plots for 1920-21:—

No. of plots.	Return per acre.
3	Below 20 bushels
22	Ranging from 20 to 40 "
21	" 40 to 60 "
17	" 60 to 80 "
5	" 80 to 100 "
4	" 100 to 122.2 "

The awards made in connection with the competition are shown in tabulated form.

PRIZE WINNERS.

RESULTS OF JUVENILE CORN-GROWING COMPETITION, 1920-21.

Name of Competitor.	Age.	Yield per Acre in Bushels.	Points Awarded for Yield—Maximum Points, 75.	Quality of Grain and Uniformity of Ear—Maximum Points, 15.	Records Field Data—Maximum Points, 10.	Total Points—Maximum 100.	Remarks.
			SPECIAL PRIZES.				
Miss E. Marks, Alberton	15⅚	122·2	75	6·8	5	86·8	No. 1 Dist. 1st, £10.
T. A. Smoothy, Pinelands	17	113·3	69·6	10·1	6	85·7	No. 3 Dist. 2nd, £5.
H. M. McGinn, Oakey Ck., *via* Eumundi	14½	113·5	69·7	8·2	4	81·9	No. 2 Dist. 3rd, £3
			NO. 1 DISTRICT.				
Miss E. Marks, Alberton	15⅚	122·2	75	6·8	5	86·8	1st, £5
W. Schmidt, Alberton	13	73·9	45·4	9·3	4	58·7	2nd, £2.
A. Schmidt, Alberton	14	69·4	42·6	8·6	4	55·2	3rd, £1.
R. Jonasson, Alberton	12½	66·5	40·8	9·9	4	54·7	
L. C. Jonasson, Alberton	15 1/12	67·19	41·3	7·8	5	54·1	
H. Beitz, Alberton	13 1/12	64·1	39·4	8·9	3	51·3	
M. M. Noe, Rathdowney	16 1/12	40·4	24·8	8·1	3	35·9	
F. W. Noe, Rathdowney	18	41·59	25·5	7·2	3	35·7	
H. J. Dunn, Cryna	11	34·18	21·0	9·7	3	33·7	
W. E. Patterson, Glamorgan Vale	18	31·6	19·4	6·97	3	29·37	
E. Voigt, Lark Hill, Walloon	13 1/12	28·9	17·7	7·27	4	28·97	
R. Behm, Mt. Forbes	16¼	22·6	13·8	10	5	28·8	
W. O. Griffiths, Mt. Forbes	18	21·04	12·9	9·1	5	27	
H. Gray, Cryna	12	23·99	14·7	8·9	2	25·6	
J. J. Patterson, Glamorgan Vale	13	23·3	14·3	6·2	3	23·5	
E. Wilkinson, Boyland	15	18·6	11·4	5·4	3	19·8	
			NO. 2 DISTRICT.				
M. H. McGinn, Oakey Ck., *via* Eumundi	14½	113·5	69·7	8·2	4	81·9	1st Prize, £5
C. G. Adcock, Eel Creek, Gympie	17 7/12	94·5	58	9·1	9	76·1	2nd, £2.
A. G. McGinn, Oakey Creek, *via* Eumundi	16½	104·6	64·3	7·27	4	75·57	3rd, £1
N. J. Gordon, Cedar Creek	16	84·9	52·2	8·1	1	61·3	
S. Mountford, Woodford	8	70	43·0	9·0	3	55·0	
D. Mountford, Woodford	10	67·3	41·3	8·5	3	52·8	
V. T. Greensill, Mungar	12¾	62·04	38·1	7·9	2	48·0	
F. Carseldine, Woodford	11⅓	55·9	34·3	9·5	3	46·8	
H. J. Carseldine, Woodford	16⅙	53·9	33·1	9·6	3	45·7	
A. T. Hill, Fairneyview	10	49·3	30·3	7·4	3	40·7	
W. F. Nugent, Coal Creek	16⅙	42·5	26·1	7·5	3	36·6	
M. Pacey, Wanora	11⅔	39·4	24·2	5·8	3	33	
N. J. Kersnovske, Mungar	13	36·3	22·3	6·6	3	31·9	
M. H. Fielding, Mungar	16	29·1	17·8	7·27	6	31·07	
E. Nugent, Coal Creek, Esk	14 7/12	35·0	21·5	7·2	2	30·7	
G. J. Nolan, Fernvale	13	29·5	18·1	5·3	3	26·4	
J. P. Elliott, Woodford	14¼	27·5	16·9	7·1	2	26·0	

RESULTS OF JUVENILE CORN-GROWING COMPETITION, 1920-21—*continued.*

Name of Competitor.	Age.	Yield per Acre in Bushels.	Points Awarded for Yield—Maximum Points, 75.	Quality of Grain and Uniformity of Far—Maximum Points, 15.	Records Field Data—Points, 10.	Total Points—Maximum 100.	Remarks.
			No. 3 DISTRICT.				
T. A. Smoothy, Pinelands	17	113·3	69·6	10·1	6	85·7	1st, £5.
H. Morgenstein, Pinelands	18	76	46·7	10·6	4	61·3	2nd, £2.
J. Morgenstein, Pinelands	13	64·4	39·5	9·1	5	53·6	3rd, £1.
M. Thies, Pinelands ..	$13\frac{7}{12}$	62·03	38·1	8·0	1	47·1	
C. J. Burgess, Pinelands ..	12	53·3	32·7	8·7	3	44·4	
L. P. Walker, Glenaven ..	$14\frac{1}{4}$	49·2	30·2	7	6	43·2	
C. Thies, Pinelands ..	$17\frac{1}{2}$	47·3	29·0	9·6	4	42·6	
F. W. Pagel, Ma Ma Creek	13	16·3	10·0	7·1	1	18·1	
			No. 4 DISTRICT.				
C. W. Rackemann, Tingoora	$11\frac{3}{4}$	74·9	46	8·6	5	59·6	1st, £5.
H. G. Rackemann, Tingoora	$14\frac{1}{2}$	71·8	44·1	9·8	5	58·9	2nd, £2.
F. P. Farr, Reedsdale ..	$14\frac{11}{12}$	71·8	44·1	6·7	4	54·8	3rd, £1.
C. Black, Kumbia ..	9	55·7	34·2	6·8	3	44	
A. Mickan, Silverleaf, *via* Murgon	18	42·1	25·8	10·27	6	42·07	
E. Nebe, Coolabunia ..	$14\frac{5}{12}$	43·3	26·6	8·9	6	41·5	
M. Black, Kumbia ..	10	46·6	28·6	6·9	3	38·5	
V. L. Wenck, Booie road, Kingaroy	15	40·0	24·5	7·5	3	35·0	
E. W. Davy, Wattle Grove	13	37·6	23·1	7·7	3	33·8	
M. E. McNickol, Wooroolin	15	32·3	19·8	7·5	4	31·3	
S. J. Davy, Wattle Grove	$10\frac{11}{12}$	29·2	17·9	7·1	3	28·0	
			No. 5 DISTRICT.				
W. Gon Chee, Killarney ..	17	96·2	59·1	10·2	8	77·3	1st, £5.
B. Gon Chee, Killarney ..	13	88·3	54·2	8·6	5	67·8	2nd, £2.
R. Gon Chee, Killarney ..	$11\frac{1}{2}$	70·7	43·4	8·9	5	57·3	3rd, £1.
G. C. Black, Goomburra ..	16	45·3	27·8	8·77	5	41·57	
P. Dorfield, Wellcamp ..	$15\frac{5}{6}$	42·2	25·9	7·27	7	40·17	
E. Ge.tz, Allora	17	37·7	23·1	8·1	3	34·2	
J. T. Collard, Clifton ..	11	28·4	17·4	6·97	1	25·37	
J. W. Collard, Clifton ..	14	21·05	12·9	7·4	3	23·3	
A. Hooley, Fletcher's Siding	$14\frac{1}{3}$	18·7	11·4	7·2	3	21·6	
			No. 6 DISTRICT.				
W. Meredith, Gurgeena ..	$16\frac{1}{2}$	61·7	37·9	10·8	4	52·7	1st, £5.
E. D. Meredith, Gurgeena	$14\frac{1}{4}$	61·4	37·7	10·27	4	51·97	2nd, £2.
C. G. Meredith, Gurgeena	$14\frac{1}{3}$	44·3	27·2	5·7	4	36·9	*
J. U. Meredith, Gurgeena	$12\frac{1}{4}$	43·7	26·8	6·0	4	36·8	
			No. 7 DISTRICT.				
V. Kussrow, Rosalie Plains	$13\frac{7}{12}$	33·3	20·4	6·97	3	30·37	1st, £5.
T. Dunn, Hunterton ..	14	27·8	17	6·5	3	26·5	*
H. J. Stanford, Hunterton	14	26·4	16·2	7·0	3	26·2	
			No. 8 DISTRICT.				
W. H. McLaughlin, Yeppoon	$15\frac{11}{12}$	49·1	30·1	8·4	4	42·5	No prize*
			No. 9 DISTRICT.				
S. Favier, Kairi	10	85·9	52·8	6·9	1	60·7	1st, £5.
C. A. Schroder, Kairi ..	$13\frac{5}{12}$	58·3	35·8	8·3	6	50·1	*
E. F. Pasetti, Kairi ..	$16\frac{11}{12}$	49·4	30·3	5·9	2	38·2	

Special prizes of the value of £10, £5, and £3 will be awarded to the competitors who stand first, second, and third in the entire competition.

DISTRICT PRIZES.—First, **£5**; Second, **£2**; Third, **£1**.

* If there are less than six competitors, prizes will be allotted as follows :—

Four to five competitors (inclusive), two prizes, first and second.

Two to three „ „ one prize only, first.

When only one competitor, he, or she, will be debarred from participating in the District Prize, but will be eligible to compete for the Special Prizes.

No money prizes will be given, but each successful competitor will be allowed to select some article to the value of his prize.

Photo., "The Week."

PLATE 47.—THE ARENA, GYMPIE SHOW, 1921.

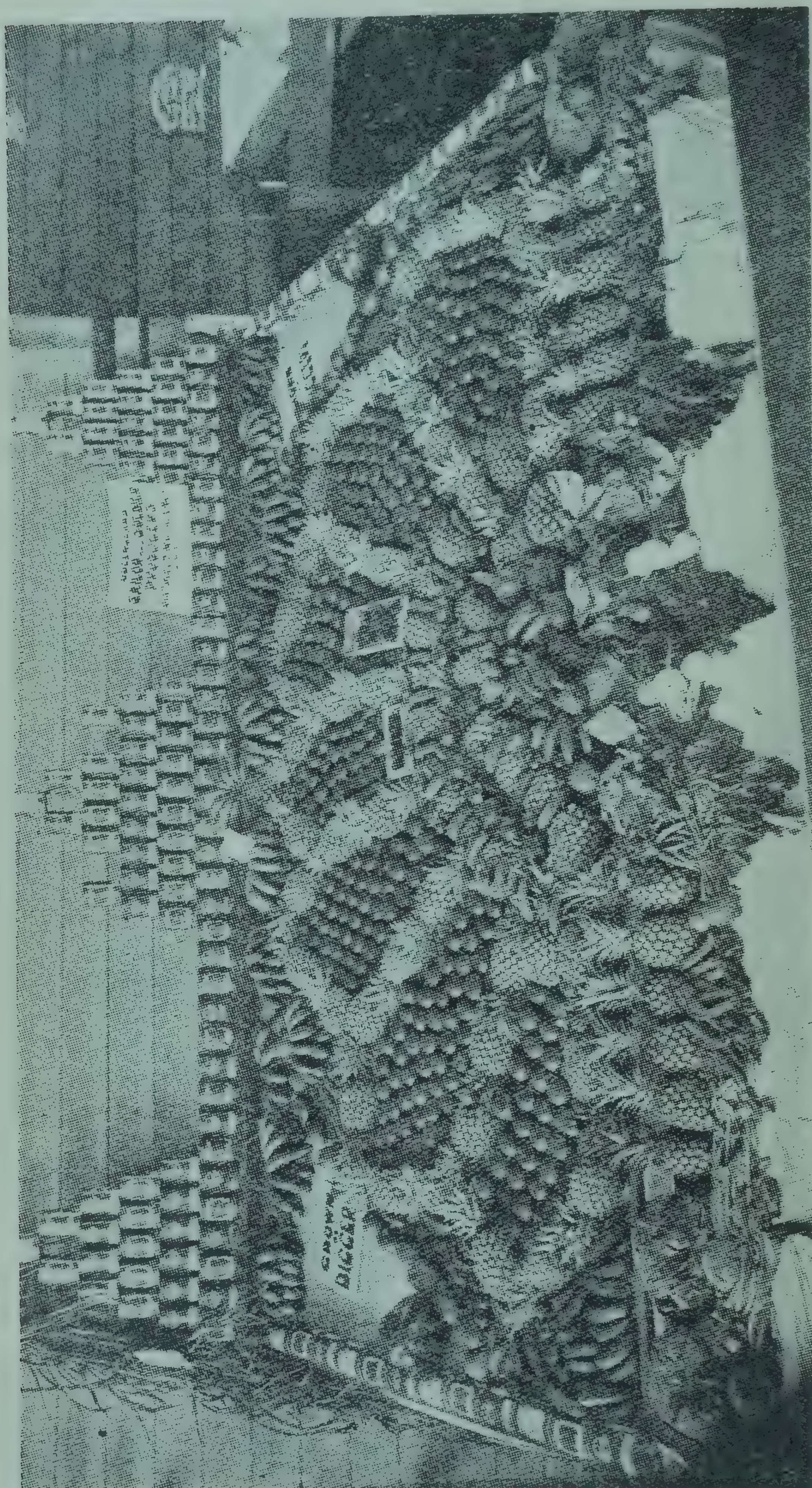


Photo., "The Week."]

PLATE 48.—RETURNED SOLDIER SETTLERS' FRUIT DISPLAY, GYMPIE SHOW, 1921.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records of Cows for August, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Bellona	Ayrshire ..	26 June, 1921	1,277	4·1	58·58	
Thyra of Myrtleview	,, ...	31 July ,,	1,387	3·6	55·48	
Iron Plate	Jersey ...	12 July ,,	929	5·1	55·43	
Prim	Holstein ...	9 Mar. ,,	1,146	4·0	51·36	
College Mignon ...	Jersey ...	7 July ,,	832	5·0	48·73	
College Cold Iron	,, ...	10 Mar. ,,	783	4·4	38·67	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	832	4·0	37·18	
Miss Betty ...	Jersey ...	7 July ,,	779	4·2	36·66	
Charming Damsel	Ayrshire ...	12 May ,,	627	4·0	28·51	
Wattle Blossom ...	Guernsey ...	21 May ,,	519	4·7	27·47	
Miss Fearless ...	Ayrshire ...	21 May ,,	584	3·9	25·41	
Confidence... ...	,, ...	8 Feb. ,,	521	4·3	25·11	
College Cobalt ...	Jersey ...	6 Jan. ,,	428	5·0	25·03	
Hedges Dutchmaid	Holstein ...	26 May ,,	597	3·7	24·58	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	447	4·8	24·18	
Rosine	Ayrshire ...	19 Jan., 1921	555	5·9	24·14	
Lilia	,, ...	3 April ,,	521	4·1	23·89	
College Grandeur	Jersey ...	29 Dec., 1920	412	4·9	23·62	
Netherton Belle ...	Ayrshire ...	30 Oct. ,,	487	4·3	23·49	
Confidante ...	,, ...	12 May, 1921	464	4·5	23·46	
Royal Mistress ...	,, ...	19 Mar. ,,	585	3·6	23·40	
Comedienne ...	Jersey ...	26 Nov., 1920	394	5·0	23·04	
Hedges Madge ...	Holstein ...	15 Aug., 1921	570	3·6	22·80	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	385	5·0	22·52	
College Ma Petite	,, ...	23 Oct. ,,	367	5.2	22·33	
Affection of Gowrie Park	Ayrshire ...	8 Sept., 1921	509	3·9	22·15	
College Meadow Sweet	Holstein ...	15 May ,,	512	3·8	21·67	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	340	5·2	20·63	
Snowflake	Shorthorn...	21 Dec., 1920	427	4·3	20·59	
Thornton Fairetta	Jersey ...	15 Mar., 1921	331	5·2	20·14	

NEUTRALISATION OF ACID IN CREAM.

By FREDERIC J. WATSON, Instructor in Dairying, Department of Agriculture and Stock.

Owing to the acid condition in which farm-separated cream is delivered to factories, especially during the summer months, it is necessary, in preparing it for pasteurisation, to reduce the acid in the cream to between .2 per centum and .3 per centum.

The complexity of the physical and chemical make-up of cream, its susceptibility to a variety of changes in composition, together with irregularities in the preparation and use of neutralisers, frequently cause fluctuations in the results of neutralisation, and interferes with the desired accuracy of results of neutralisation.

It is, therefore, advisable in neutralising cream, to aim at obtaining a standard of acid of .25 per centum in order that possible fluctuations in results may not endanger the quality of the butter made from the cream.

The following remarks on neutralisation are obtained from the publications on the dairy industry by Otto F. Hunziker, a high American authority on butter manufacture, who has made an exhaustive study of the matter.

OBJECTS OF NEUTRALISATION.

1. To avoid excessive loss of fats that results from churning cream that is pasteurised while extremely sour.

2. To guard against the production of undesirable flavours in cream, which are prone to result when cream high in acid is pasteurised at a high temperature.

3. To improve the keeping quality of butter made from high-acid cream. (Butter made from high-acid cream does not keep well.)

These are among the objects that can be accomplished by neutralisation. They all hinge on the reduction of the acid in sour cream before pasteurisation.

Improvement of the flavour of butter made from tainted cream, or the removal of rancidity by neutralisation, is not possible. This fact has been conclusively established.

When neutralising cream it is essential that the following particulars should be observed:—

(1) Adoption of a definite standard of acidity.
(2) Correct and accurate test for acidity. (This may be made by means of a decinormal alkali (caustic soda) solution, using phenolphthalein as an indicator.)
(3) Choice and use of the right kind of neutraliser.
(4) Making right strength of neutraliser.
(5) Adding the neutraliser to the cream in the right manner.
(6) Checking of results by retesting.

NEUTRALISERS.

Neutralisers must have alkaline properties, must be alkalies, or alkaline earths or their carbonates.

Alkali is a substance that neutralises acids, forms salts, and that saponifies fats.

Common alkalies that have found application in factories are carbonate of sodium (soda ash) and of calcium (chalk), bicarbonate of soda (baking soda), hydrate of soda (soda lye), of calcium in the form of lime water and milk of lime, and the oxides of calcium and magnesium (quick lime and magnesium lime).

Carbonate and bicarbonate of soda are readily soluble, and therefore are easily made up into solutions of desired strength. This is a distinct advantage.

Calcium carbonate is very insoluble and slow of action, and therefore unsuitable for the purpose.

All carbonates liberate carbon-dioxide gas when added to sour cream. This is claimed by some to be an advantage, for the reason that when the carbon-dioxide gas is percolating upwards through the cream it carries with it volatile gases with objectionable odours, and thereby removes from the cream undesirable odours and flavours. The extent and value of this claim has been found to be over-rated and the subsequent inprovement of the butter overestimated.

The disadvantage of the use of carbonates and bicarbonates is that they deprive the operator of the ability of checking his work, because the carbon dioxide formed in the cream when these neutralisers are used reacts acid, causing the test to show higher acidity than the lactic acid content of the cream represents.

The generation of carbon-dioxide gas in sour cream by the use of carbonates and bicarbonates often presents mechanical difficulties, causing the cream to foam up and over the vat unless they are used with great care.

Carbonates and bicarbonates are liable to corrode metal surfaces of vats and coils, causing chemical compounds which are injurious to the quality of the cream.

Butter made from cream neutralised with soda lye, sodium carbonate, or sodium bicarbonate is prone to have a soapy flavour. This is especially true of cream of high original acidity and cream in which the acidity is reduced to the neutral point.

Of the hydrates, lime appears to be the only really suitable alkali to use. It is mild in action, does not injure the flavour of the butter if used intelligently, does not appreciably attack metals of vats and other equipment, it tends to form, with that portion of the cream with which it reacts, a precipitate of relatively great

stability and resistance against bacterial action, and it combines with the curd, first rendering that portion of the curd which enters into the composition of the butter less acid, thereby minimising the acidity of the butter and its deteriorating power.

Sodium hydrate, the cheapest form of which is soda lye, has strong caustic properties, and the sodium lactate formed in sour cream has injurious effect on the metal of vats and coils, and causes butter to contain metallic salts detrimental to its flavour and keeping qualities.

With lime hydrate (slaked lime) properly prepared and intelligently used, and using sufficient quantity only to reduce the acidity to .25 per cent. or thereabout, no objectionable flavour effects occur.

Limy flavour in butter is due to the abuse of lime, resulting from inaccurate and faulty methods.

Limy flavour may show when the lime mix is too concentrated and is not adequately diluted when added to cream.

Another common cause of limy flavour, due to over-neutralisation, lies in the fact that when liming is done by guess only, the cream is usually tested after neutralisation, and if the acidity is higher than desired, more neutraliser is added. Since the action of lime is slow and is not completed until after the cream is pasteurised, it is obvious that the acid test made immediately after neutralisation does not indicate the true ultimate acidity of the cream. If more lime is added on the basis of this test, there is a danger of over-neutralisation, resulting in limy flavour and other defects.

Finally, lime is a natural constituent of milk and butter; it is not only harmless, but represents one of the essential minerals required by the human body for maintenance and, especially, for growth.

[Opinions differ as to the use of lime as a neutraliser, and it is not generally recommended by officers of this Department, who prefer bi-carbonate of soda for the reasons already set out by Mr. Watson.—Ed.]

If any portion of the neutraliser, however small, enters into the composition of butter, it is essential that it add to, rather than detract from, the healthfulness and dietetic value of the butter.

From the standpoint of the consumer, therefore, it is not only the least harmful, but, in fact, the most beneficial, and hence the most suitable, alkali for the neutralisation of cream.

On account of its slight solubility in water, viz., to the extent of .137 per cent. in cold water and .075 in boiling hot water, lime in the form of a clear solution of lime in water is unsuitable, for the reason that to reduce acidity in cream from .85 per cent. to .25 per cent. it would require the volume of lime water to be twice the volume of the cream to be neutralised.

It must, therefore, be used as milk of lime. The lime mixture may be made of calcium oxide (quicklime), in which case time must be taken to thoroughly slake it. Or it may be made of lime hydrate (slaked lime).

If incompletely slaked, slaked lime is unsatisfactory, as it generally contains much lime carbonate, which is coarse, does not strain readily, is insoluble, and is slow of action in the cream.

Thirty-seven pounds of dry lime hydrate will neutralise 90 lb. of lactic acid, hence the amount of lime hydrate required to neutralise .01 lb. or .01 per cent. of lactic acid in 100 lb. of cream is .00411 lb.

But the lime hydrate is not added to the cream in dry form, but as milk of lime, consisting of 2 lb. of lime in 1 gall. of mixture; therefore, the amount of lime mixture required to neutralise .01 per cent. of lactic acid in 100 lb. of cream is .01644 lb.

Example:—2,000 lb. of cream contains .6 per cent. of acid which is required to be reduced to .25 per cent.

Original acid in cream	.6 per cent.
Acid required	.25 per cent.
Acid to be neutralised	.35 per cent.

Therefore, lime mixture $= .35 \times 2{,}000 \times .01644 = 11.5$ pints.

However, neutralisation of sour cream and neutralisation of an aqueous solution of lactic acid are two vastly different things; and it has been conclusively demonstrated, by the authority abovementioned, both by laboratory and factory tests, that while in aqueous acid solution the neutralising action of lime is complete, in cream

not all the lime added goes to neutralise the lactic acid present. These tests have shown that for neutralisation purposes it is necessary to use in the neutraliser mixture 2.4 lb. of lime instead of 2 lb.; or to use a type of hydrated lime which has a stronger alkalinity, such as magnesium lime, which contains, in addition to calcium hydrate, 30 to 50 per centum of magnesium oxide, and their actual neutralising strength averages 16 per cent. to 20 per cent. greater than hydrated lime containing 100 per cent. of calcium hydrate.

When using magnesium lime, 2 lb. in the gallon of mixture is sufficient.

The reason for the incomplete reaction of lime in cream is due to the affinity of lime for curd. While the lime is capable of, and does, exert its full neutralising strength in aqueous solutions of lactic acid, a portion of the lime (about 16 to 20 per cent.) when added to cream fails to act on the lactic acid.

In explanation of this, it is well known that casein has a marked affinity for calcium. In raw sweet milk and cream the casein is present as a calcium salt. When cream becomes sour, the lactic acid thus formed removes calcium from the casein. This leaves a part of the casein as free casein, which is a solid, and a part occurs as casein lactate, which is in colloidal state.

The casein lactate, however, is readily hydrolised; upon neutralisation it is precipitated, becoming solid, so that from the standpoint of neutralisation of cream it may be considered equivalent to free casein.

When lime is added to the sour cream the concentration of the acid is very greatly reduced, and the concentration of the casein increased to excess. In the presence of free casein these conditions are most favourable to the formation of calcuim caseinate.

Since both the lime, in the form of milk of lime, and the casein are in a similar physical state, and have a specific chemical attraction for each other, it appears unnecessary for the calcuim to go into solution in order to react on the casein.

SUMMARY OF THE ACTION OF LIME ON CREAM.

1. When a sufficient amount of lime is added to sour cream to theoretically reduce the acidity in cream to .25 per centum, and the lime fails to accomplish the full extent of this reduction, about 16 to 20 per centum of the lime does not react.

2. This delinquency may be corrected by using approximately 20 per centum more lime hydrate, thus making the lime mixture about 16 per centum stronger than required theoretically, or by using magnesium lime instead of calcium lime. Magnesium lime containing 35 to 50 per cent. of magnesium oxide has an alkalinity equivalent in strength to approximately 116 per cent. to 120 per cent. of pure calcium lime.

3. Lime has a marked affinity for casein. The absorption of lime by the casein, and the reduction of the casein acid, are greater than the absorption of lime by the serum, and the reduction of the lactic acid.

4. When neutralisation is carried to the neutral point, the distribution of the neutralising action in the components of the cream—the serum, curd, and fat—is similar with sodium hydrate as it is with lime water.

5. The acid test of the cream determines the total acidity of the cream, including both the casein acid and the lactic acid.

6. The deficiency of the neutralising action of the lime is due to physical and mechanical combinations between portions of insoluble lime and curd. The fact that from 16 per cent. to 20 per cent. of the lime does not react in the cream must be attributed to the great affinity of the lime for casein, particles of lime adhering and becoming permanently attached to particles of free casein. In this condition the lime so held is unable to exert its full neutralising action.

INSTRUCTIONS FOR NEUTRALISING WITH LIME.

1. Secure hydrated lime (slaked lime) that is relatively free from carbonates.

If the hydrated lime is a calcium lime (containing not over 5 per cent. of magnesium oxide), make up a lime mixture, or milk of lime, by using 2.4 lb. of the dry hydrated lime for every gallon of mixture.

2. If the hydrated lime is a magnesium lime containing not less than 30 per cent. to 35 per cent. of magnesium oxide, make a lime mixture, or milk of lime, by using 2 lb. of the dry hydrated lime for every gallon of mixture.

3. Magnesium lime is more satisfactory than calcium lime.

4. For making up lime mixture in small quantities, use a 10-gall. can; put into the can 24 lb. of calcium lime, or, preferably, 20 lb. of magnesium lime; fill half-full of water until emulsion is complete; then fill the can with water, and stir again. This now represents the milk of lime, lime mixture, or lime neutraliser.

Use the method abovementioned to calculate the quantity of the neutraliser required to reduce the acidity of the cream to .25 per cent.

7. Thoroughly stir the lime mixture in the can, and then measure out with a gallon measure, graduated to half-pints, the required amount of neutraliser, as indicated by the method of calculation abovementioned.

8. Strain it through a cheese cloth with a garden sprinkling-can, add an equal amount of water, and sprinkle the neutraliser over the cream in all parts of the vat.

9. Keep the cream agitated while the neutraliser is being added.

10. Always make sure that the quantity of cream and the test of original acid are correct, that the milk of lime has been properly mixed before removing the required amount from the lime-mixture can, and that the neutraliser is properly diluted before it is added to the cream.

11. It is advisable not to heat the cream above 90 degrees Fahr. before the neutraliser is added.

RAPID METHOD OF DETERMINING EXCESSIVE ACIDITY IN MILK.

By J. C. BRUNNICH and E. GRAHAM.

As it is a requirement of the *"Dairy Produce Act of* 1920" that all milk delivered to a cheese factory for cheesemaking purposes shall be graded in accordance with its quality, and that no milk containing more than .25 per cent. of acidity (lactic acid) shall be classified as first grade quality by a milk-grader at a cheese factory, there is occasioned a need for a rapid method of ascertaining the individual supplies of milk which may contain acidity in excess of that prescribed under the Act, and to this end we have devised a method, full particulars of which are given below.

APPARATUS.

The apparatus, which was made under our instructions by Messrs. Wilson and Nafis, consists of one 50 c.c. burette, graduated in the customary way in c.c. and one-

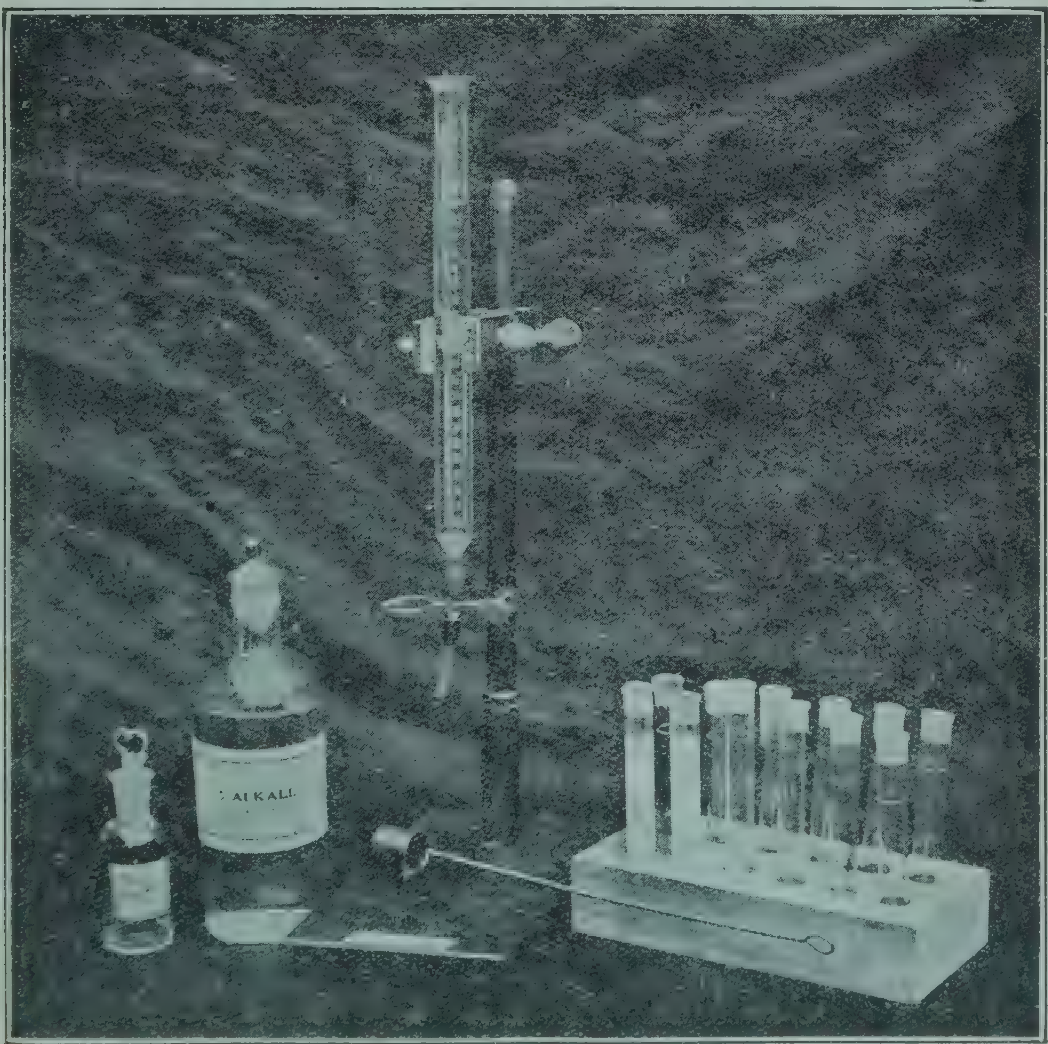


Plate 49.—Acidity Tester

fifth part c.cs., and on the left side, marked to show 2.5 c.cs., the burette being fitted with an ordinary pinchcock and fixed on a stand. A set of test tubes in a stand is provided. Each test tube has a frosted top to enable a distinguishing mark being applied to it for identification purposes, and has two graduation marks, the lower one to correspond to 2.5 c.cs., and the upper one to 11.5 c.cs. One metal measure to hold approximately 9 c.cs. of milk, one bottle of deci-normal $\frac{N}{(10)}$ alkali solution, and one drop bottle containing phenolphthalein.

METHOD OF MAKING A TEST.

The burette is charged with alkali solution and 2.5 c.cs. of same is run into each of the required number of test tubes. A sample of milk is drawn from each can after the contents are well mixed, by the aid of the metal measure, and this complement of milk is discharged into the test tube, filling the tube to the level of the higher graduation mark. The alkali solution and milk are then thoroughly mixed by closing the top of the tube with the thumb and inverting the tube several times. Afterwards a couple of drops of phenolphthalein is added to the mixture in the test tube, and at this stage it is well to observe if any pink colouration appears. The tube is again shaken, and if the colouring completely disappears it is evident that the milk contains a greater amount of acidity than is prescribed under the Act as applied to milk of first-class quality. On the other hand, where the more or less pinkish colour remains, a comparatively lower percentage of acidity is indicated, in which case the milk may be accepted as containing a lower percentage of acidity than is mentioned in the Act.

This completes the test, but should it be desirable to determine the actual percentage of acidity in the milk, the same apparatus may be used, and a slightly different method is to be followed by placing 9 c.cs. of milk, preferably measured with a 9 c.c. pipette (to be ordered specially) into a porcelain dish, adding to it several drops of phenolphthalein, and stirring the mixture with a glass rod, which can be obtained, showing in its interior a pink coloured paper of the exact tint to which the milk should be coloured, by the addition of the necessary amount of alkali run out from the burette.

Then, by reading the number of c.cs. of alkali discharged from the burette, and dividing same by 10, the actual percentage of lactic acid contained in the milk is ascertained.

A photograph, for the purpose of showing the complete apparatus necessary for the test, appears in conjunction with this article.

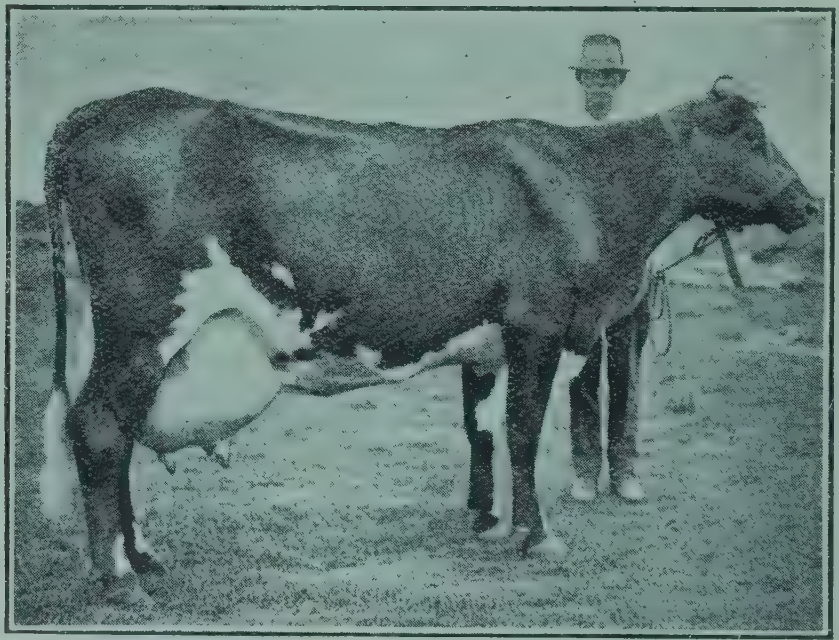


Photo. Live Stock Bulletin.]

PLATE 50.—CHARMER 2ND OF CITY VIEW (I.M.S.), THE PROPERTY OF MR. M. LAWRENCE.

Winner of the Royal National Champion Butter Fat Test, 1921.

PLATE 51.—GAIETY OF MARINYA, THE PROPERTY OF MR. J. H. FAIRFAX.
First Prize Ayrshire Cow, 5 years or over, in milk; and Champion, Brisbane Exhibition, 1921.

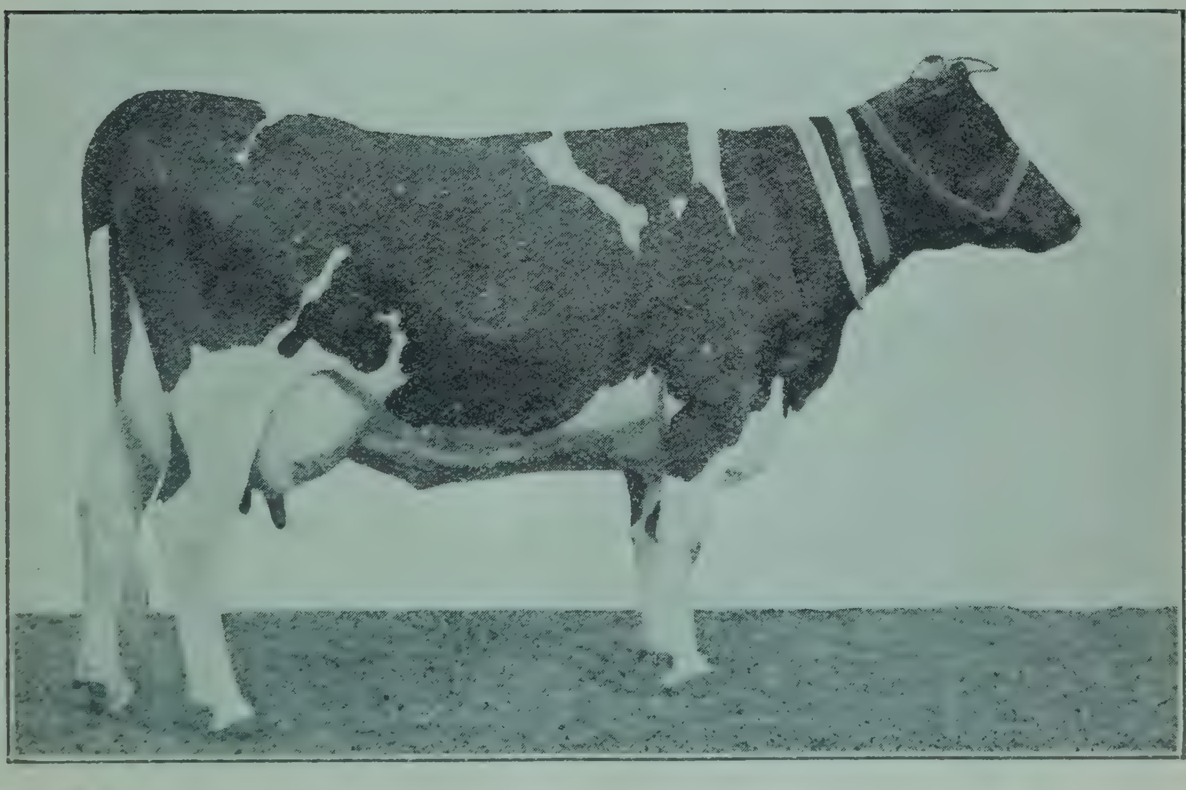


PLATE 52.—MAGGIE 3RD OF NESTLES, THE PROPERTY OF NESTLE'S AND ANGLO-SWISS CONDENSED MILK COMPANY.
Winner of Class for Cow yielding largest supply of milk in 48 hours, Brisbane Exhibition, 1921.

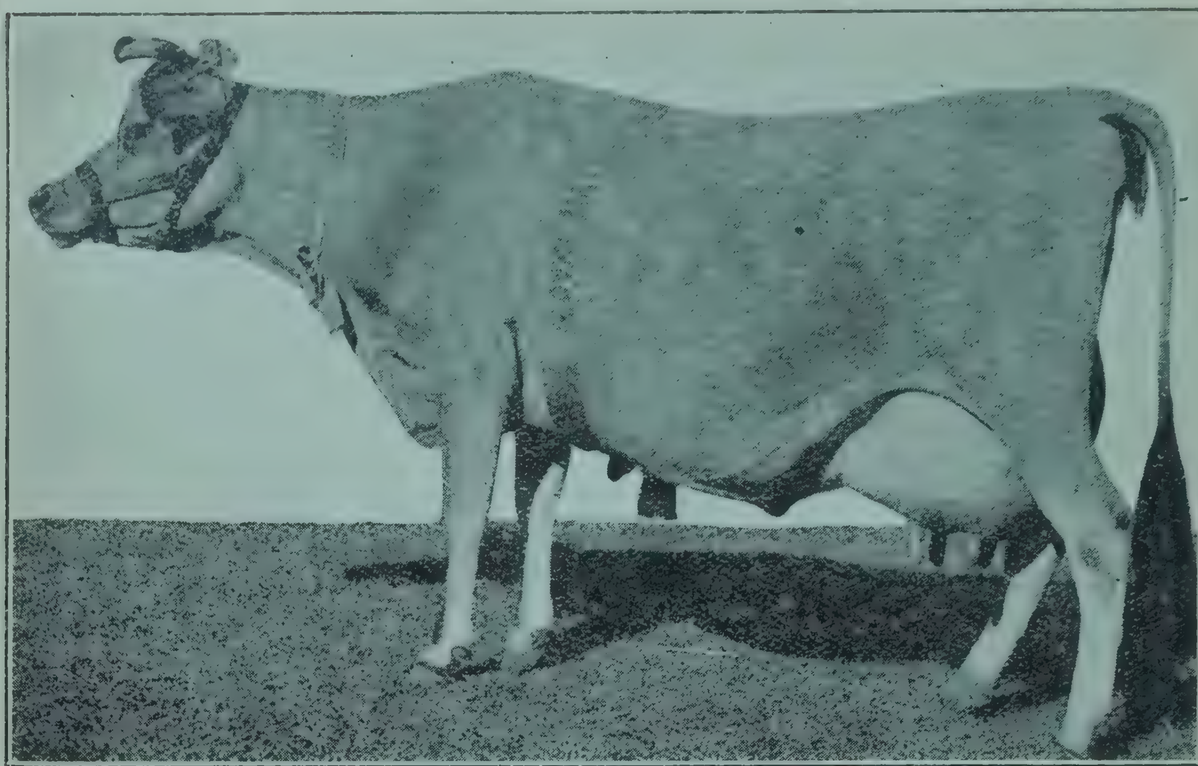


Plate 53.—Larkspur, the Property of Messrs. W. D. Carr.
First Prize Cow, 5 years old and over, in milk; winner of the Special Prize for Cow and three of her progeny; and Champion Jersey Cow, Brisbane Exhibition, 1921.

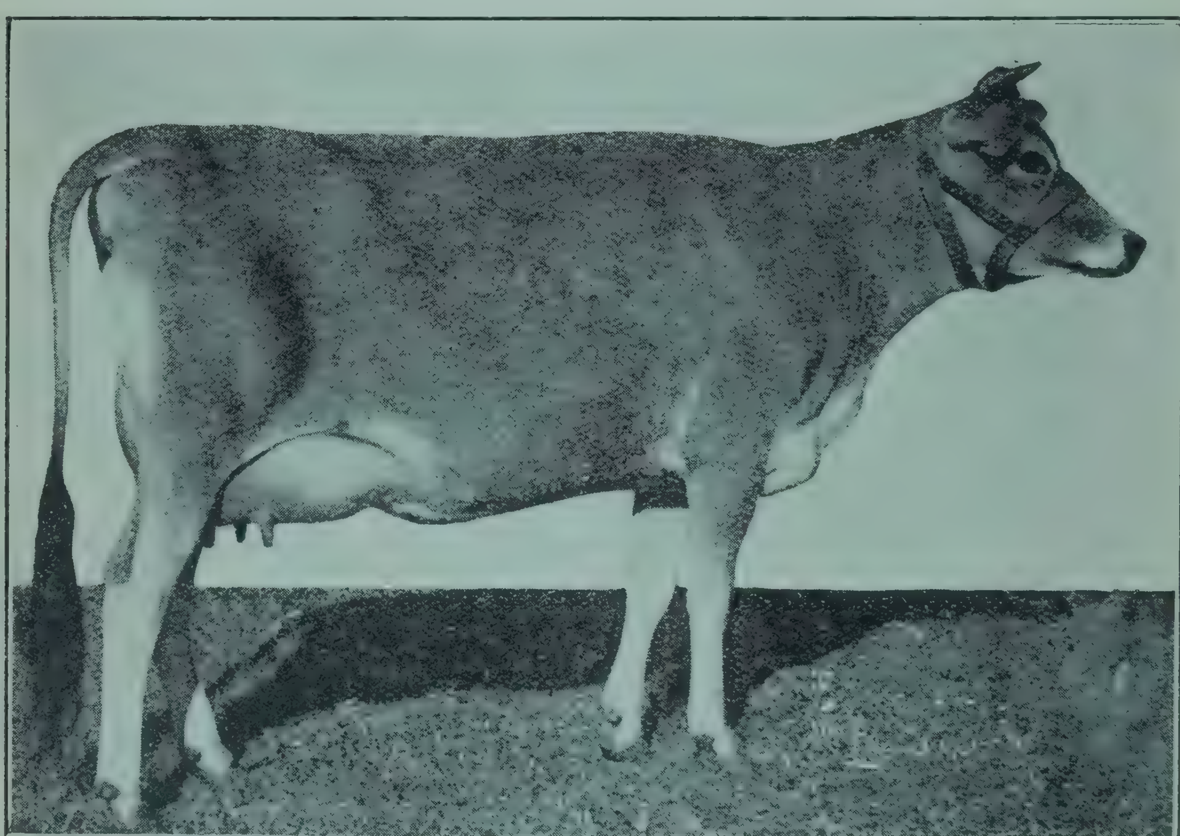


Plate 54.—Oxford Golden Buttercup, the Property of Mr. E. Burton.
First Prize Jersey Heifer, 2 years and under 3 years, in milk; 1st in Class for Heifer any breed, under 4 years, averaging the greatest daily yield of butter-fat for 48 hours,

Photo. Live Stock Bulletin.]

Plate 55.—Lyndhurst Royal Peer 24th, the Property of Mr. C. E. McDougall.

First Prize Shorthorn Bull, 18 months and under 2 years. Royal National Association Exhibition, 1921.

Photo. Live Stock Bulletin.]

Plate 56.—Proud Peer of Tolarno, the Property of Mr. G. C. Clark

Champion Aberdeen Angus Bull of Queensland, 1921.

PLATE 57.—FRIESIAN HERD OF CATTLE, BRISBANE EXHIBITION, 1921.

Exhibitors whose Herds were represented:—Queensland Agricultural College, S. H. Hosking, Nestles and Anglo-Swiss Condensed Milk Company, Grindles Ltd., Geo. Newman, P. P. Falt, F. G. Brown, C. Behrendorff, A. A. Petrie, A. G. Muller, E. C. McConnel, E J. Wecker, W. G. Reading.

The Horse.

CERTIFICATES OF SOUNDNESS.

August list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
	DRAUGHT STALLIONS.	
Pride of Glenore	J. H. Kilvington	Forest Hill
Phœnix	Jondaryan Estate	Jondaryan
Clansman	F. J. Bishop	Herston Road, Kelvin Grove
King Arthur (L)	Queensland Agricultural College	Gatton
Donald Crystal (L)	L. E. Walker	Brisbane
	BLOOD STALLIONS.	
Count Savin (L)	J. McGilp	Dalby
Delinacre (L)	L. Winten	"Vuna," Whitewood
	TROTTING STALLIONS.	
King Bells	R. Cox	Toowong
St. Malo	J. W. Hart	Blackbutt
Major Marcus	Rees, Thomas, Ltd.	Townsville
Tommy Holmes (L)	A. W. Baulch	Biggenden
Ribbonmont (L)	A. R. Carr	Zillmere
	PONIES.	
Tibby (L)	R. Hanlon	Kangaroo Point, Brisbane
Comet (L)	E. J. Harris	Park Road, South Brisbane

BOT FLY.

By A. H. CORY, M.R.C.V.S.

To prevent the flies from finding a suitable lodgment for their eggs, the long hairs should be clipped off or singed from the nose, lips, jaws, shoulders, and legs of all horses. Regular daily grooming should be carried out to detach any fly eggs before they have time to hatch, and the parts from which the long hairs have been removed should be smeared daily with a mixture of linseed oil 20 parts, turpentine or kerosene 1 part. All manure containing bots or grubs should be destroyed by burning.

After a horse is affected, viz., when the bot fly grubs are in the stomach, medicines are of little service in removing them until the summer months, when they are being naturally expelled. It is then advisable to drench with one of the following drenches:—

(1) Turpentine 2 oz., mixed in 1 pint of milk; or

(2) Carbolic acid 2 drachms, glycerine 2 oz., water 4 oz., milk 1 pint.

Either of these drenches should be followed in a few hours by giving 5 drachms of aloes, as a ball, or 1 pint of raw linseed oil.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, AUGUST, 1921.

There was during August a seasonable increase in production. During the latter portion of the month the eggs were weighed, and full details of weights will appear in the report for September. There was one death during the month, Mrs. Anderson's "C" hen dying of tuberculosis. The laying of W. Becker's pen of Langshans was excellent, the total of 166 being the highest monthly score during the present test. For thirty-two days this pen of six birds did not lay less than five eggs per day. The following are the individual records:—

Competitors.	Breed.	Aug.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	138	628
*W. and G. W. Hindes	Do.	142	602
*J. M. Manson	Do.	147	601
H. C. Thomas	Do.	120	596
F. Birchall	Do.	123	588
Oakleigh Poultry Farm	Do.	129	574
*G. Trapp	Do.	125	572
*Mrs. R. Hodge	Do.	133	562
*C. M. Pickering	Do.	120	547
*H. Fraser	Do.	117	542
*H. C. Towers	Do.	126	542
R. C. Cole	Do.	119	541
*J. W. Newton	Do.	106	524
W. A. Wilson	Do.	121	522
*W. Becker	Do.	134	508
*T. Fanning	Do.	118	498
*Chris. Goos	Do.	121	493
Mrs. E. White	Do.	131	490
H. Stacey	Do.	127	487
Bathurst Poultry Farm	Do.	118	487
*E. Chester	Do.	113	485
*R. C. J. Turner	Do.	117	480
M. F. Newberry	Do.	120	475
O. C. Goos	Do.	111	470
W. Barron	Do.	103	469

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Aug.	Total.
LIGHT BREEDS—*continued.*			
*Thos. Taylor	White Leghorns... ...	117	467
Mrs. E. Z. Cutcliffe	Do.	113	464
E. Stephenson	Do.	106	461
J. W. Short	Do.	109	456
*Thos. Eyre	Do.	110	455
*S. L. Grenier	Do.	121	453
*G. Williams	Do.	124	449
*B. Chester	Do.	113	447
*Mrs. L. Anderson	Do.	109	443
*Haden Poultry Farm	Do.	112	434
*W. and G. W. Hindes	Brown Leghorns... ...	120	432
*E. A. Smith	White Leghorns ...	119	430
Linquenda Poultry Farm	Do.	124	427
W. M. Glover	Do.	108	396
*H. P. Clarke	Do.	110	387
Brampton Poultry Farm	Do.	101	358
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	158	667
Jas. Potter	Do.	111	634
*J. Ferguson	Chinese Langshans ...	147	612
Rev. A. McAllister	Black Orpingtons ...	142	596
*T. Hindley	Do.	129	588
Jas. Every	Langshans	135	575
*A. E. Walters	Black Orpingtons ...	133	575
Jas. Ryan	Rhode Island Reds ...	136	572
W. Becker	Langshans	166	569
*R. Burns	Black Orpingtons ...	144	568
G. Muir	Do.	137	563
*Parisian Poultry Farm	Do.	144	553
*C. C. Dennis	Do.	138	550
*E. F. Dennis	Do.	129	524
*J. Cornwell	Do.	142	510
*E. Morris	Do.	133	505
*E. Stephenson	Do.	122	497
*R. Holmes	Do.	90	483
G. Cumming	Do.	119	467
*H. Chaille	Do.	109	444
*Mrs. G. Kettle	Do.	126	436
J. W. Newton	Do.	138	435
*N. A. Singer	Do.	138	431
*J. E. Smith	Do.	147	431
*A. Shanks	Do.	121	413
*E. Oakes	Do.	132	367
F. Harrington	Rhode Island Reds ...	135	346
T. C. Hart	Black Orpingtons ...	100	285
Total	...	8,599	34,438

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
W. and G. W. Hindes	109	89	101	114	111	78	602
J. M. Manson	91	106	109	92	111	92	601
Geo. Trapp	95	87	94	94	102	100	572
Mrs. R. Hodge	89	106	105	96	103	63	562
C. M. Pickering	100	95	87	81	107	77	547
H. Fraser	101	79	96	85	95	86	542
H. C. Towers	98	78	93	72	91	110	542
J. W. Newton	93	105	101	80	78	67	524
W. Becker	98	101	74	76	114	45	508
T. Fanning	95	78	83	78	74	90	498
Chris. Goos	87	105	51	57	72	121	493
E. Chester	85	89	81	77	75	78	485
R. C. J. Turner	85	75	76	67	86	91	480
Thos. Taylor	73	91	77	56	67	103	467
T. Eyre	76	77	50	81	89	82	455
S. L. Grenier	79	100	50	79	75	70	453
G. Williams	113	84	50	63	67	72	449
B. Chester	71	70	94	66	87	59	447
Mrs. L. Anderson	69	87	80	65	84	58	443
Haden Poultry Farm	66	61	73	77	71	86	434
W. and G. W. Hindes	59	61	54	92	70	96	432
E. A. Smith	102	78	74	70	65	46	430
H. P. Clarke	100	57	66	39	62	63	387
HEAVY BREEDS.							
J. Ferguson	106	94	89	113	105	105	612
T. Hindley	107	97	103	83	105	93	588
A. E. Walters	104	102	89	93	87	100	575
R. Burns	48	84	125	76	115	120	568
Parisian Poultry Farm	88	91	91	122	59	102	553
C. C. Dennis	102	84	74	101	93	96	550
E. F. Dennis	68	96	84	86	85	105	524
J. Cornwell	83	64	90	101	86	86	510
E. Morris	86	93	47	105	83	91	505
E. Stephenson	94	76	83	80	72	92	497
R. Holmes	63	77	81	96	110	56	483
H. Chaille	56	83	74	102	83	46	444
Mrs. G. Kettle	69	89	101	48	55	74	436
N. A. Singer	70	58	70	74	64	95	431
J. E. Smith	103	104	77	63	47	37	431
A. Shanks	43	71	59	77	80	83	413
E. Oakes	30	85	63	89	56	44	367

CUTHBERT POTTS,
Principal.

Horticulture.

HORTICULTURAL NOTES.

In the bush-house, caladiums will now need attention. Remove bulbs from storage and carefully scrape off any decay that may be found around base of bulb, and dust same with a little powdered charcoal. Pot in good, rich compost. Do not have the soil too fine. Leave a few peaty lumps, or the fibre portion of rotted turf, a little smallish charcoal and a sprinkling of fertiliser; soil sifted fine sets too hard. Newly potted caladiums do not require much water—just a sprinkle occasionally, gradually increasing as they commence to shoot. When in good growth, they can hardly have too much water, providing the drainage is good. If you have a nice warm corner where the leaves will not get too much of the afternoon sun, caladiums do well in the open ground, making fine plants and developing strong bulbs.

Dahlias will now require attention. Divide up old bulbs. In separating the tubers it is necessary to have an eye to each portion; this can best be obtained by cutting down through the old stem, a piece of which should be left on each bulb. After division, the tubers may be laid in the ground temporarily until the shoots appear, when they can be planted in their permanent positions. Have your stakes ready and place them in position before bulbs are planted; this often saves trouble.

Asters, salvias, and petunias may still be planted out from seed beds. They like a bright sunny position, as also do portulaca, amaranthus, celosia, cockscombs, and zinnias, whilst partially shaded positions are best for asters and balsams.

Remove all spent winter annuals, and prepare ground for abovementioned plants. Keep the hoe or small digging fork going, thus killing weeds and keeping the surface from caking.

TREATMENT FOR FISTULA.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

When a fistula on withers is forming, it is customary to apply a blister or hot fomentations. This on rare occasions appears to effect a cure, but in the majority of cases it hastens the swelling and brings it to a head. After it has broken, surgical treatment is required.

The next thing to find out is the direction and depth of the fistula. This is done by using a flexible probe, some 8 or 9 in. in length. Free drainage must now be given by opening along the full length of the probe, or, if thought advisable, an opening can be made at the lower part of the probe, and a seton of tape or other material passed through and tied on the outside. A seton keeps the wound open and assists in draining the cavity, but the first method of opening up is generally found more satisfactory. Both sides of the withers should be opened, if necessary, and any necrosed (dead) tissue removed. The top of withers should not be opened crossways—from side to side—because there is a ligament which runs along the middle line of shoulders from the head. If cut, it causes serious consequences.

The chief points to remember are:—Free drainage, the removal of all dead tissue, and the prevention of pockets where pus can accumulate.

The following lotion should be used every third day on the fistula after it has been opened up, until four applications have been applied:—

Corrosive sublimate	½ oz.
Methylated spirit	1 pint.

This is best applied by soaking some cotton wool or other absorbent material with the lotion, then packing the saturated cotton wool in the fistula. Knives, probes, &c., should be thoroughly disinfected before using, by placing them in boiling water or some disinfectant such as carbolic acid, condy's fluid, &c. Knives and other steel instruments should not be allowed to come in contact with the corrosive sublimate solution.

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the subjoined report (dated 16th September, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

Ayr District.—All the local mills are now crushing, and it is expected that the tonnages will be better than anticipated. The cane now being harvested from Pioneer and Kalamia (early in August) is of very fair density, some of the figures given to me being as follows:—

Plant H.Q. 426	18.67 c.c.s.
Plant Badila	17.40 c.c.s.
Ratoon Badila	17.20 c.c.s.
Plant S. Singapore	16.00 c.c.s.
Plant Q. 855	14.50 c.c.s.

The main varieties grown are Badila, H.Q.426, N.G.24, 24A, 24B, with a smaller proportion of Q.855, Q.813, Striped Singapore, Q.970, Q.903, Q.1121, Hybrid No. 1, 1900 Seedling, and B.208. A paddock of the lastnamed, belonging to Messrs. Land Bros., Rita Island, looks very healthy. Some splendi Hybrid No. 1 will also be cut on this farm. Upon Mr. Fraser Clark's farm at Jarvisfield, some fine Badila is being harvested. The soil upon this farm is mainly a very deep black loam, and of a wonderfully fertile nature.

Planting is still being carried out. The area of plant cane to be cut this year at Pioneer Mill is represented by about 2,890 acres, but this figure will certainly be exceeded for 1922.

At Kalamia about 2,700 acres of plant cane will be harvested, but so far this year only about 2,300 acres have been planted.

The density figures of the lastnamed mill were very high at the time of my visit, averaging about 16 c.c.s. At Pioneer some very fair Q.855 was being crushed, with a density of 14.55 c.c.s.

An innovation in these localities is the use of windmills for watering purposes. A number is now in use or in course of installation, and are optimistically regarded by users. With the introduction of a cheaper form of irrigation a very large area of good land could be profitably put under cane in this area.

The champion stool of cane at the Ayr Show was a splendid sample of H.Q. 426, grown by Mr. Geo. Taylor, whilst the first prize for best collection of three sticks each, of not more than twelve varieties, went to Mr. H. K. Kastener.

The varieties shown by him were Q.970, Q.903, Badila Seedling, N.G.24, N.G.24A, N.G.24B, H.Q.426, Q.1121, B.208, Q.855, Q.813, and Hybrid No. 1. These comprised a very fine exhibit, well displayed. Another fine exhibit was Messrs. Todd Brothers' three stocks of Plant Badila.

So far the Burdekin district has not suffered very much from pests. Borers were noticed in a few places, and grubs were noticed on the S.E. side of Plantation Creek.

Systematic and regular collection of beetles and grubs does much to minimise this evil.

Invicta Mill (Haughton Sugar Company).—The mill is now crushing, and a fair supply of good density cane is going through. So far it is hard to say how the earlier estimates of the crop will turn out. The principal varieties grown are H.Q. 426, Badila, Q.813, Q.855, N.G.24, 24B, and B.208.

In an earlier report I mentioned that Mr. Wright, a local grower, had previously suffered severely from grubs, and after planting the cane he is now cutting, treated it with 40 lb. of arsenic to the acre. He covered the plants with a little soil, used the arsenic on top, and later filled in the balance of the earth. He is now cutting this cane, and it looks far better than any in grubby areas adjoining.

Adjoining the Haughton River are several grub-infested farms, the owners of which are now employing the same measures to control the pest. Mr. Snow, a grower here, when replanting a block that was eaten out as very young plant cane

(although treated with some 40 lb. of arsenic) placed the new plants alongside of the old poisoned ones, and got an excellent strike. He thinks that the grubs were so "busy" with the old plants that they had no time for the new. At present, apart from the railway, all hauling is done per dray. With a tramway system in operation the cane supply would certainly be more assured.

After Ayr, Home Hill was visited. At the State Farm a section is being devoted to canegrowing, and a couple of crates of proven new varieties from the Mackay Experimental Station, and also some Tableland Badila, have been planted out. Irrigation experiments are also planned.

Inkerman Mill.—This mill is now in full swing, and promises to have a better tonnage than was expected earlier. The average density is fair, and steadily improving. About 5,320 acres of plant cane will be cut this year, but so far only about 4,400 acres are planted for 1922. The irrigation scheme is being put into operation as rapidly as possible, and its successful completion is anxiously awaited by the growers. Quite a number of new houses are being built.

In a former report I mentioned that Mrs. Hayward, a local grower, had given a block of land a very heavy dressing of filter press obtained from the mill. As a plant crop, the cane only went about 19 tons per acre, but the ratoon crop shows a splendid growth. One half of the block was planted with Badila and the balance with H.Q.426. The latter half looks very poor in comparison with the Badila.

Up the river from the mill Mr. D. Horwood is growing several varieties obtained from the Mackay Sugar Experiment Station on an unirrigated farm. He has Q.813, Q.855, Badila Seedling, Hybrid No. 1, Q.903, Q.1121, and one or two others. This year he is cutting some of it as first ratoons, and among the varieties Q.903 stands out for vigorous growth.

Herbert River District.—Two mills are in operation. The cane seems to be going in well and it is all very clean. The principal canes grown are Badila, H.Q.426, N.G.24, N.G.24A, N.G.24B, Innis, H.Q.409, and 1900 Seedling, but the two former are the most favoured varieties by far.

Due to continuous wet, lack of warmth, and also, to an extent, the presence of borers and grubs, the cane has not made as rapid a growth as it should have done, but, even so, a very fair tonnage will have been put through by the end of the season.

It is understood that permission to plant further areas has been granted by the company. Owing to causes mentioned above, a fair area of land has yet to be planted for 1922. A large number of the farmers are now using lime. A very fine class of earth lime can be obtained at about £2 8s. per ton locally, the using of which should soon repay the growers for their outlay. Green manuring and artificial fertilising are also coming into favour. Of the latter, artificial mixed manures, sulphate of ammonia, as well as meatworks manures, are used extensively.

A good deal of interest is being taken here in the work of the experimental stations. Mr. Enticnap and Mr. Wittrup, of Macnade, have just received a quantity of plants from the South Johnstone stations, and have distributed these among neighbouring growers. Mr. Wilkinson, the manager of Macnade, is also carrying out some very interesting experiments in connection with new cane varieties and at present is growing Korpi, Naremo, Oramboo, and H.Q.409.

Long Pocket and Hawkins Creek seem to have suffered more from grubs than other parts of the area. It will be remembered that Mr. F. S. Skinner, of Victoria, used a dressing of about 40 lb. of arsenic mixed with lime, on a two-months-old crop of plant cane, running it through a manure distributor alongside of the cane and covering over with a disc cultivator. Later, he dressed the crop with 2 lb. sulphate ammonia to the acre. Although the paddock had been previously eaten out by grubs, the cane got a good start and continued growing, and at time of writing promises to cut well. Adjoining blocks have suffered severely from grubs. In some paddocks borers were doing damage; "gumming" was also observed in many places.

It must be most strongly emphasised that the utmost care should be taken in selecting plants for seed from any area in which the presence of gum is noticed. If plants are taken from a healthy portion of an infected paddock, it is recommended that they be cut a day or so before using, kept under shelter from rains or heavy dew, and closely examined at both ends before planting; any showing the slightest trace of gum should be discarded.

Among the cane exhibits at the recent local show the most noticeable were some splendid stools of Badila exhibited by Messrs. Dawson Bros. and Messrs. E. and G. Venables. These were exceptionally good and fit to be shown anywhere.

On the Herbert a good deal of planting is done by hand, but among the machines used, Mr. Enticnap's combined driller and planter was noticed doing good work. It is drawn by four or five horses, worked by a man and a boy, and carried enough plants for an 18-chain drill; it is claimed to drill and plant nearly 6 acres per day. A manure distributor may also be worked at the same time.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (6th September, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"*Bundaberg.*—In the course of the month, Bundaberg district plantations have been inspected, including the canegrowing areas of Avondale, Miara, Bingera, Gin Gin and Maroondan.

"In the Bundaberg areas conditions are practically the same as set out in my last report. Cane is cutting satisfactorily, and the young plant crops are making good growth. Frosts have not been severe, but were sufficiently intense to curl the leaves of the cane on several farms, more particularly on the Woongarra side. The following particulars were supplied by Mr. Herbert Young, of Fairymead, regarding his observations during the frosty nights of the month:—

Yuban	Frosted
D.1135	Hardly touched
E.K.1	Badly frosted
E.K.28	Badly frosted
Q.1098	Frosted
D.10	Hardly touched
H.Q.77	Frosted
Q.470	Touched
Q.694	Touched
C.S.R.3	Badly frosted
Q.812 A	Hardly touched
N.G.81	Frosted
Reintroduced D.1135	Not touched
Q.822	Badly frosted
Shahjahanpur	Not touched

"An outstanding characteristic of the last-mentioned cane is its immunity from frost. This cane is growing rather thinly in the stick, but it is of good content and strikes and stools well. Careful selection of plants by the farmers may, in a few years, bring out the thickening of the individual canes.

"Black Innis is a variety which is being extensively planted this year in the Bundaberg district. It is an early maturing cane of fair sugar content. It is hardly a satisfactory cane in respect to the ratoons, however, and arrows freely about mid-autumn.

"Q.813 and 1900 Seedling are making a good showing on Woongarra and Barolin farms. The latter, however, is rather shyly striking, and is slowly establishing its root system. It is probable that in planting, if the farmer could cut five eye plants instead of three, and then destroy two of the eyes. they would surmount much of the slow-rooting difficulty. This is a surmise, however.

"A general note of satisfaction prevails at present among the growers, as the harvest is progressing without a hitch, and any industrial differences are being amicably settled.

"At Avondale and Miara satisfactory crops are being harvested. The frosts have slightly touched the cane, but the damage is negligible. Whenever there is a lull in cutting operations the farmers are busy preparing for the spring planting. The majority of the growers are planting early in an endeavour to get a twelve months' crop for next year. No disease is apparent. Practically all of the heavier soils on these areas would now be benefited by the use of lime.

"At Bucca, the growers are meeting with more success than has been the case for some years. The crops are well grown and healthy, and the cane that is being cut shows a fairly high percentage c.c.s., with good weight per acre. Long haulage is a drawback, but transport facilities have lately much improved. Varieties that appear to be giving the best returns are D.1135, and on the river banks 1900 Seedling. H.Q. 285 is making a good showing, and on present appearances it would be worth the growers' while to encourage this variety.

"The use of green manures is strongly recommended on Bucca highlands. The soil is deficient in humus.

"Conditions at Bingera are highly satisfactory this year. The cane is cutting with good density and weight per acre, and the different varieties going to the mill are crushing well. 1900 Seedling is giving about the best returns all round, although D.1135, B.156, Mahona, Badila, and Q.813 are canes that are giving good results.

"The cane at Bingera is free from disease—that is, as far as can be seen in the course of ordinary observation. On some areas there, leaf mottling is noticeable, but this ought not to be mistaken for striped leaf disease. This mottling is generally due to adverse soil conditions, and sometimes culminates in an entire yellowing of the

leaf. The symptoms of striped-leaf disease are irregular streaks of pallid green of unequal length and width, but elongated in the direction of the long axis of the leaf, on a background of normal green. This description would enable a farmer to generally distinguish the disease on, say, B.208.

"In the Gin Gin locality there is considerable agricultural activity. In addition to the harvesting, planting and ploughing are in progress, farmers in many cases breaking up land that has not been under cultivation for years. Losses through disease and insect pests are not severe this year, although on isolated patches the moth borer is active.

"On some of the farms the question of rotation of varieties might be considered by the growers. Gumming and striped-leaf disease are nurtured by a careless or indifferent attitude towards changing of varieties. In the Gin Gin district, probably those most profitably planted are D.1135, Black Innis, H.Q.285, and 1900 Seedling. All these varieties are doing well. At Maroondan, 1900 Seedling is cutting very satisfactorily and with good density. This cane could be grown here as a staple variety. B.156 is also a cane of good weight and sugar content at Maroondan. Malagache might also be profitably grown."

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 24.

WILD SAGE (*Salvia verbenaca*).

Description.—A strong-smelling perennial herb. Stems angular, clothed with rather rough hairs. Stems simple or dichotomously branched. Leaves somewhat ovate or more or less oblong in outline, the older and basal ones on long stalks, the upper ones sessile, the surface crinkled, and the edges toothed and crenulate. Flowers small, pale blue, in distinct whorls along a slender spike; each whorl of flowers subtended by two bracts. Fruiting calyx hairy, about four lines long, strongly ribbed. Nutlets ("seeds") at the bottom of the calyx tube, about one line long, nearly black.

Distribution.—A common English and European plant now naturalised in most temperate countries. In Queensland it is confined more or less to the Darling Downs.

Botanical Name.—*Salvia,* from Latin *salvo,* I save, on account of the common use of the plants as healing and curative herbs. *Verbanaca,* on account of its resemblance to the common Vervain (Verbena officinalis).

Common Names.—Wild Sage, Wild Clary, Eye Seed.

Uses.—Anne Pratte, in her work, "The Flowering Plants, Grasses, Sedges, and Ferns of Great Britain," where many notes on the uses of British plants are given, says of this one:—"Its seeds when placed in water yield a mucilage which when placed inside the eyelid for a few minutes envelops any particle of dust which may pain the eye; hence the name of the plant—Clary or Clear Eye." Our old herbalists considered it one of the most efficacious of herbs in any complaint of the eyes. A curious preparation of this plant seems to have been a favourite dish with our ancestors. Parkinson (an early English botanist) says:—"The leaves, taken dry and dipped into a batter made of the yolks of eggs, then flour and a little milk, then fried in butter till crisped, served for a dish of meate, acceptable with manie, unpleasant to none." Besides its uses in diseases of the eye, the Wild Clary is recommended for a variety of maladies.

Eradication.—So far as observed in Queensland, the Wild Sage is not a particularly aggressive weed, and calls for no special method of eradication.

Photo. by Dept. of Agriculture and Stock.]

PLATE 58.—WILD SAGE (*Salvia verbenaca*).

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

SCHOTIA BRACHYPETALA.

NATURAL ORDER LEGUMINOSAE.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—From "Flora Capensis," Vol. 2, 273, Harvey and Sonder, 1861. The genus, Schotia, was named by Jacquin in honour of a friend and travelling companion, R. Van Der Schot. There are several species, all being native of South Africa. Some are large shrubs or small trees, whilst others are fairly large trees. The specific name, *brachypetala,* alludes to the small, inconspicuous petals.

Description.—The species *Schotia brachypetala* was first described by Sonder (in Linn. Soc., Vol. 23, page 39) as a large shrub or small tree. The largest of three specimens in the Brisbane Botanic Gardens is between 20 and 25 ft. in height, with a spread of over 30 ft. The trunk is sturdy, bark dull brownish-grey, branches long, lower ones somewhat horizontal, that provide a good spreading habit. The young branches are tipped with dark-green bark, mottled with brownish spots and patches at and near the older branches.

Habitat.—Natal, in sheltered valleys where the soil is dry and rocky in the neighbourhood of Durban, also at an altitude of 2,000 ft. A very handsome tree when in full flower, well worth cultivating; it flowers in Brisbane in September and October.

Uses.—Maitland Woods, in "Natal Plants," p. 390, quotes Mr. Bazley as saying that the timber is very much like walnut, but closer in the grain. A splendid furniture wood, but bad to work, as the dust makes the eyes sore if it enters them. Takes a splendid polish; if unpolished gets much darker; is known as African Walnut.

Leaves alternate, pinnate, leaflets large ovate, oblong, or obovate, netted veined, in from four to five pairs, varying considerably in shape and size, the smallest being about ¾ in. long, ½ in. wide, the larger varying from 1½ to 2½ in. long, 1 to 1½ in. in width, sometimes tapering, sometimes truncate at base, always conspicuously, though not prominently, veined.

Flowers.—Panicles axillary and terminal, many-flowered; flowers pedicellate, calyx tube conical; petals, *very minute,* linear, hidden under the calyx lobes, stamens ten, monodelphous, ovary flattened elongated oval, about in centre of long stipe. The individual flowers, when open, are about 1½ in. in length, all parts of which are of a rich crimson colour. They are borne in dense clusters on both the larger and smaller branches on the inside of the tree; this gives it a somewhat unique appearance, and as many of the terminal shoots on outside of the tree carry foliage instead of flowers as the majority of trees do, the flowers are to some extent hidden. This prevents their being seen at any great distance from the tree, and a close view, practically under the tree, is necessary. From this position when in flower *Schotia brachyuetala* has a fine effect. The flowers appear to be full of honey, as they are a great attraction for large numbers of honey-eaters and other birds.

Pod.—These vary very much, often about 1½ in. in length, with a single seed; sometimes 2½ in. in length, with two seeds; and occasionally 5½ in. in length, with several seeds. They are from 1 to 1½ in. in width, seeds about ½ in. in length, not unlike horse beans, with a large yellow fleshy arillus attached to the hilum.

Propagation.—From seed. Although such a very free-flowering tree, it does not seed freely, only a small number being collected each year. All three specimens in the Gardens were raised from one packet of seed received from South Africa.

DEHORNING CATTLE.

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to smart, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day. With older animals a dehorning instrument must be used.

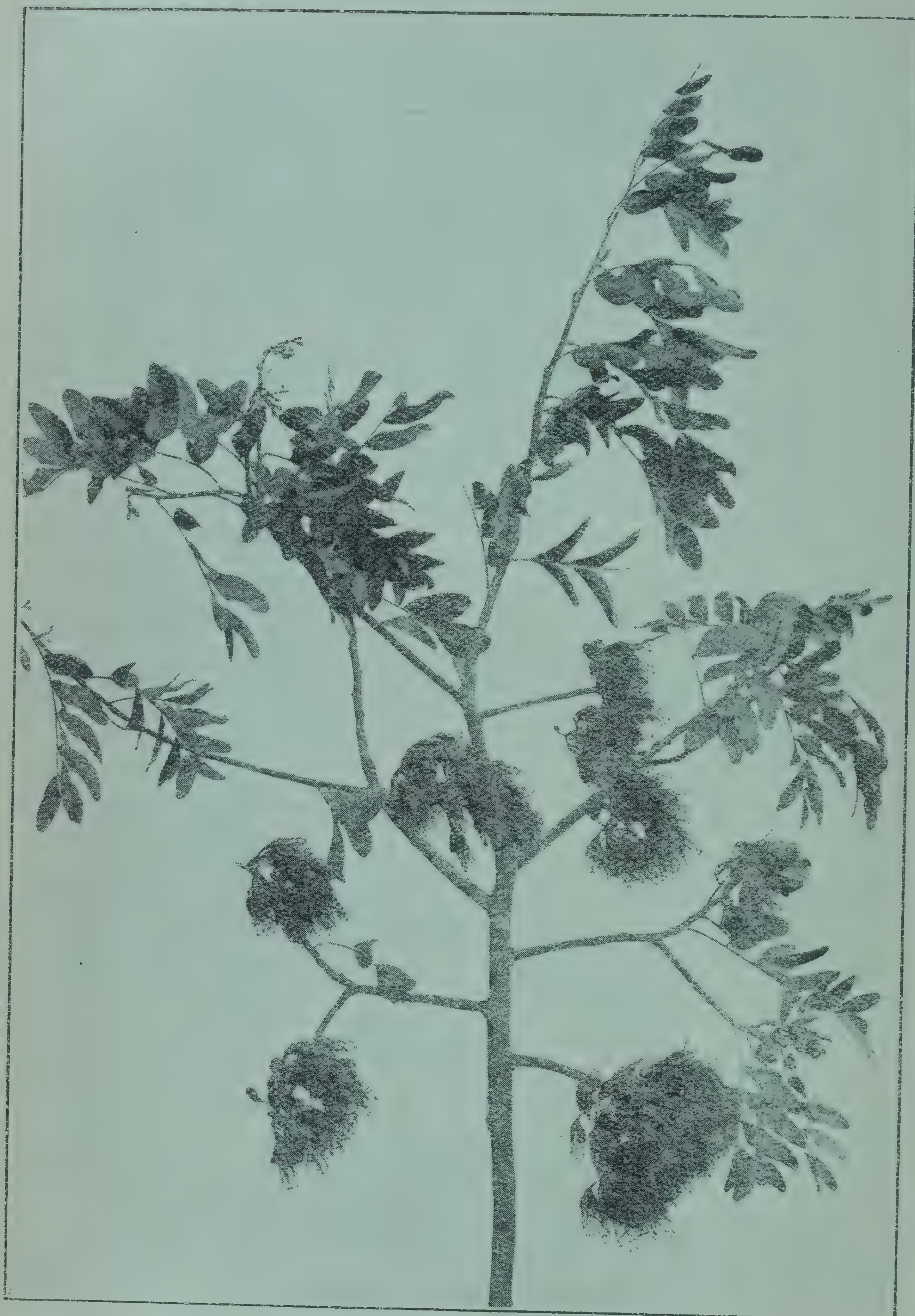


Photo. Dept. of Agriculture and Stock.]

Plate 59.—"African Walnut" (*Schotia brachypetala*).

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 7.

KODA (*Ehretia acuminata*).

Common Names.—Koda, one of the Indian names; Churnwood (North Queensland). The latter name is not to be recommended, as it is more commonly applied to *Villaresia Moorei.*

Derivation.—*Ehretia,* after D. G. Ehret; *acuminata,* Lat., meaning pointed, from *acumino,* I sharpen (referring to the pointed leaves).

Description.—A large tree attaining a height of about 90 ft. and a barrel diameter of about 2½ ft. Barrel mostly channelled and angular in section, not deeply flanged at the base (at least in Southern Queensland "scrubs"). Bark grey or brown, rather fissured, especially on the ridges of the barrel; when cut, almost white, becoming brown on exposure; 3/16 in. thick on tree, with barrel diameter of 2 ft. 8 in. Sapwood white. Branchlets green, marked by a few white dots (lenticels), and containing a fair quantity of pith. Leaf stalks often grooved on the upper side, varying in length from ½ to 1¼ in. Leaves alternate, in outline egg-shaped or elliptical, varying a fair amount in breadth, margins toothed, lighter green on the underside than above, lateral nerves and netted veins prominent, especially on the underside; measurement of leaf blade, 3 to 6 in. long, varying from two to three times as long as broad. Flowers in bunches (panicles) at the ends of branchlets and in the forks of the upper leaves; panicles shorter or longer than the leaves. Individual flowers stalkless, measuring about ⅕ in. diameter when expanded, white and strongly scented. The lowermost part of the flower, the calyx, is cup-shaped, about 1/12 in. in length, and has five rounded lobes at its rim. On the inside of the calyx are the five petals united at the base in a short tube measuring about 1/12 in. The free part of each petal measures about 1/12 in. in length. Inserted on the inside of the tube of the petals are five bristle-like stamens nearly as long as the petals. The ovary (in centre of flower) is smooth and round, and is surmounted by a bristle-like style about 1/12 in. long, which is forked at the end. Fruit globular, ⅙ to ¼ in. in diameter, splitting vertically into two parts, each part containing two cells, and each cell containing one seed.

Flowering period.—September and October.

Distribution.—India, Japan, Philippine Islands, scrubs of the coast of Queensland (north and south), New South Wales as far south as Illawarra.—(Bentham).

Remarks.—In the field this tree somewhat resembles the Churnwood (*Villaresia Moorei*) and the Lignum Vitæ (*Vitex lignum-vitæ*). As a rule, the bark is less fissured or wrinkled than the former, and rougher than the latter.

Uses.—The timber could be used with advantage for many indoor purposes, such as fittings and cabinet-making. In India it is used for making scabbards, sword hilts, gun stocks, and is employed in building and agricultural implements. The unripe fruit is pickled; when ripe it is insipidly sweet, and is eaten.—(Brandis: "Forest Flora of North-west and Central India"). Professor E. H. Wilson informed us that the wood was preferred in the East above all others for carrying poles.

REFERENCES.

Ehretia acuminata, R. Brown. "Prodromus," page 497. Bentham: "Flora Australiensis," Vol. IV., page 387. F. M. Bailey: "Queensland Flora," Part IV., page 1038. Synonyms: *Ehretia serrata,* Roxb.; *Ehretia pyrifolia,* Don.; *Ehretia ovalifolia,* Hassk.

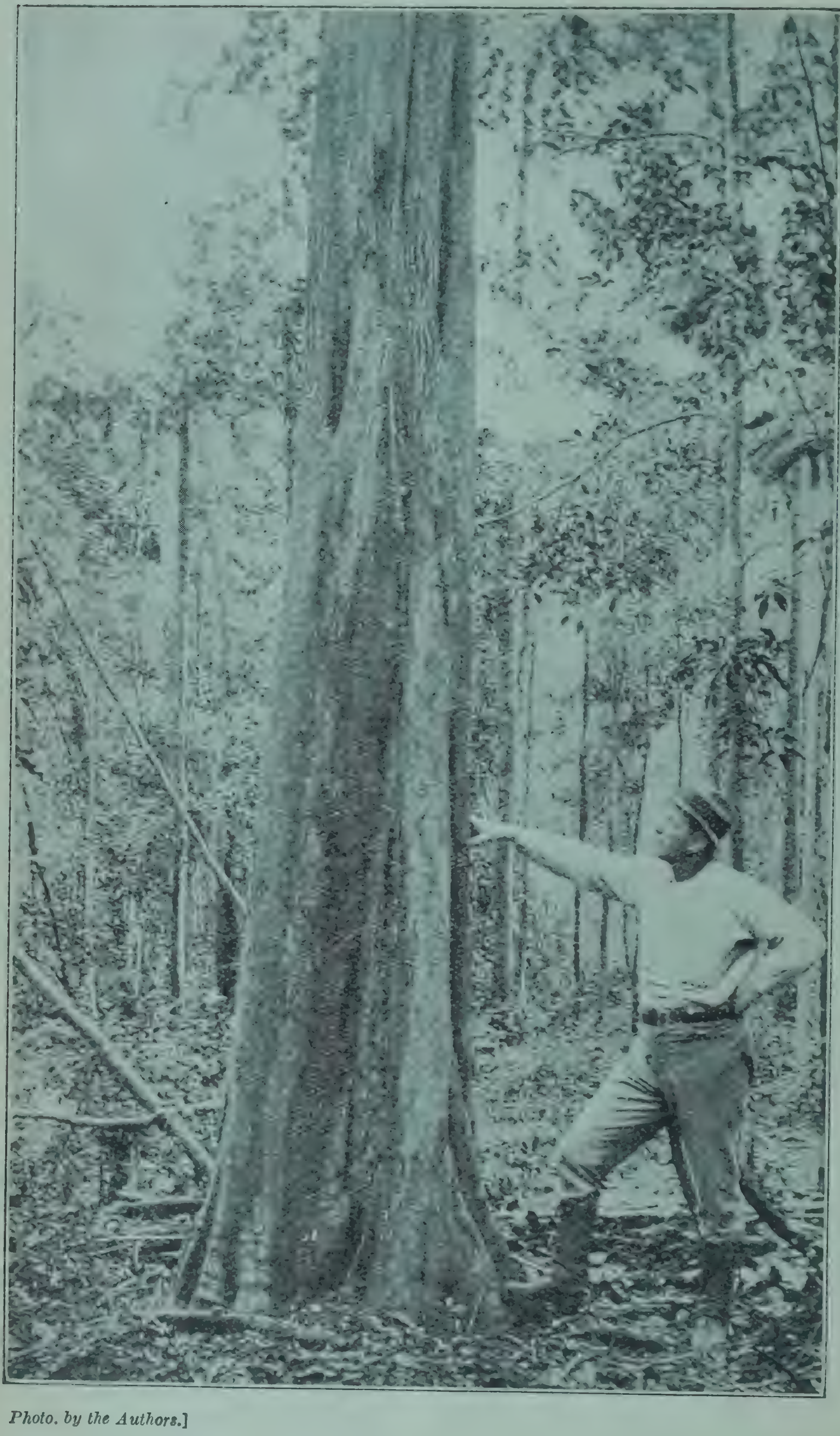


Photo. by the Authors.]

PLATE 60.—KODA (*Ehretia acuminata*), Imbil Scrubs.

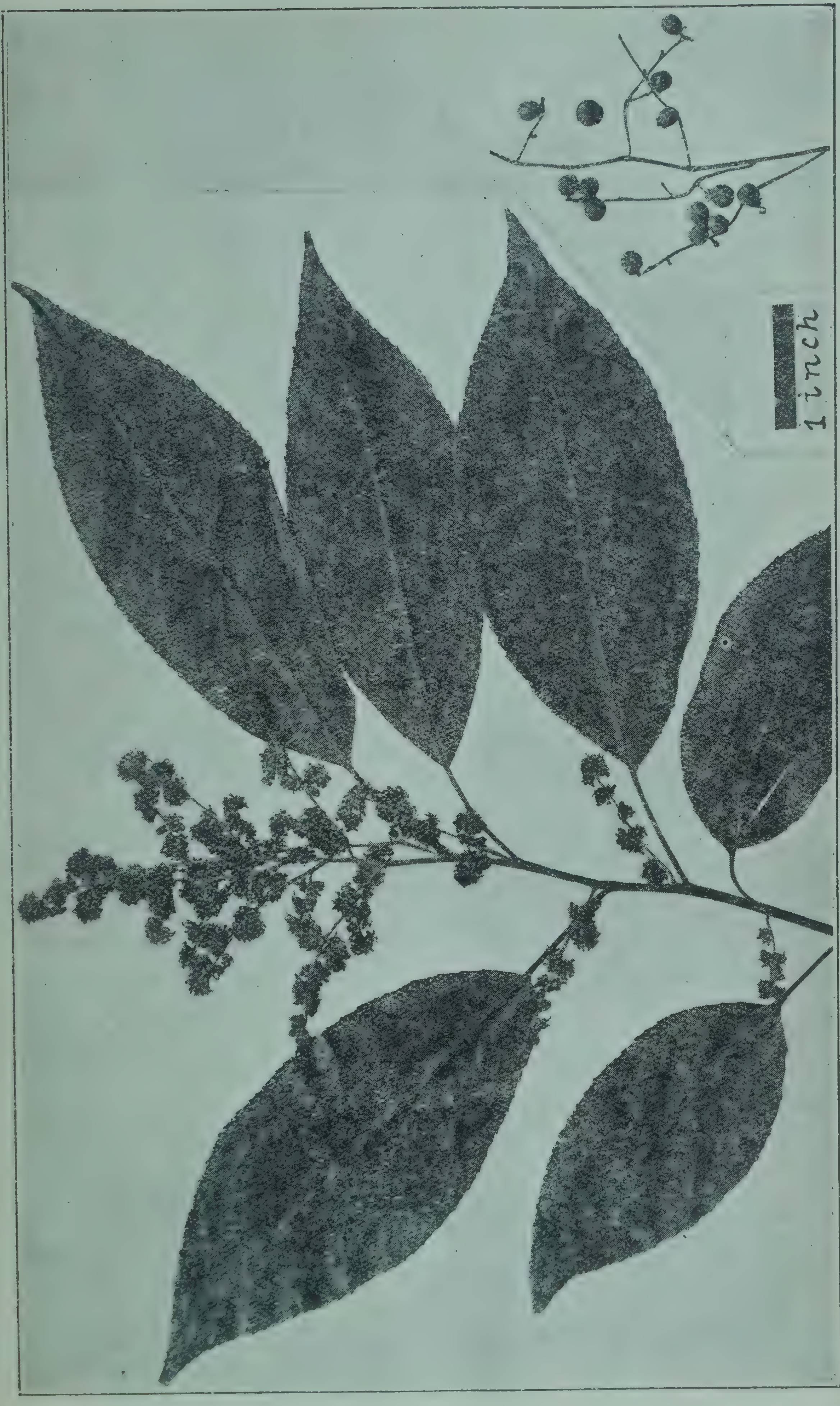


Plate 61.—Koda (*Ehretia acuminata*).

Photo. by Dept. of Agriculture and Stock.

Entomology.

CANE-GRUB CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 9th September, 1921, from the Entomologist, Mr. Edmund Jarvis:—

"The present season having been very favourable for planting, some attention has been given to station improvements of a general character, which are best carried out during the winter months. Preparations for the approaching campaign against our notorious cane-grub are now under way, and a few preliminary notes regarding various plans of procedure that may interest growers will, in the future, be included in monthly reports.

"EXPERIMENTATION WITH DETERRENTS.

"It is proposed during the coming season to take up this line of control work, which, although previously touched upon by Mr. Tryon about twenty-five years ago, has not since been followed up or submitted to scientific investigation.

"The use of deterrents has long been advocated by economic entomologists as a method of coping with many kinds of insects, and of late years attempts have been made in other countries to employ this form of control against the white-grubs of root-eating scarabaeid beetles. Our choice of repellants, however, is naturally limited to substances that will not injure the young cane, can be handled without danger, and easily applied, and are inexpensive, or moderately so. Preferably, they should be of manurial value, and admit of application in a dry form.

"Mr. A. J. Draper has kindly given me permission to experiment in this connection on the Carrah Estate, where I have already selected a portion of a block of D.1135, planted last June, that is now about 18 in. high and looking well.

"I need hardly say that this form of control will be directed against the beetle itself, our object being to deter, if possible, the egg-laden female insect from entering the ground to oviposit, by previously rendering the surface-soil around the cane stools obnoxious in some way.

"COLLECTING CANE-BEETLES.

"As already pointed out in a previous report (1915) we must not lose sight of the fact that in problems such as that now facing us, entomologists have always considered that ideal methods are essentially those in which we succeed in capturing the female insects before they have had time to deposit eggs.

"The Cairns Cane Growers' Association published in the 'Post' this month a few suggestions offered by the writer regarding the future collecting of grubs and beetles, and invited canegrowers to freely criticise same and recount their experiences in this direction. Regulation No. 4 of these suggestions stated that grubs should be collected from cane lands only, or in the immediate vicinity of same, and beetles from within a radius of about a quarter of a mile from cane land. Apparently, some of our growers do not even yet realise that leading entomologists, as a whole, after working for over thirty years at the white-grub problem, assert that up to the present no better control method than that of systematic collecting has been discovered. We naturally recommend this method to growers, because it has stood the test of practical application, particularly in Europe and America.

"One of the latest examples of such work is reported from Mauritius, as follows:—'The number of Lachnosterna (cane-beetles) captured in 1919-1920 was under 31,000,000, as compared with over 71,000,000 in the previous year, and is the lowest since 1912-1913. The figures indicate that a control has been established in those areas in which the infestation originated; it is only in the more recently invaded part of the area that the number of beetles taken is still on the increase. This view is corroborated by the results of surveys for the larvæ.'

"In 1914 we collected 22 tons of beetles in the Cairns district, which represents 8,400,000 specimens, a number able to destroy 11,000 acres of cane, which, if producing an average, say, of 15 tons per acre, would mean a loss of 165,000 tons. Since the average annual loss in the Cairns district is estimated to be about 30,000 tons, it appears that the 22 tons of beetles captured in 1914 were capable of causing

injuries amounting to more than five times that of the whole of our annual loss from grub attack. Even if less than one-quarter of these beetles had oviposited in the canefields around which they were collected, we should have prevented the destruction of about 40,000 tons of cane, an amount exceeding that of our annual loss throughout the Cairns district. The above facts are mentioned here, because I hope to show later on that our most badly grub-eaten areas of cane land around Gordonvale have been gradually invaded by this pest, which first started its encroachments about the year 1897.

"With regard to the distance from cane from which beetles might be profitably collected, I think a quarter of a mile would be insufficient. Such limitation, however, would concentrate the work upon an area harbouring beetles that were very likely to trespass on adjoining cane land. If few collectors were employed, the plan would be advisable, while in the event of many hands being available it would be advantageous, I think, to work the feeding-trees further back.

"We know that the beetles will visit cane land half a mile away, but, unfortunately, we do not know whether they will fly twice or three times that distance in order to attack cane. Under normal climatic conditions a mile is probably the limit from which we need fear invasion, but should windy weather chance to occur during nightfall, as sometimes happens, whilst beetles are on the wing (from 8 to 9 p.m.) they are liable to fly to longer distances.

"TRAPPING BEETLES IN THE FIELD.

"In 1916, whilst at Gordonvale laboratory, I pointed out the desirability of capturing female beetles during the critical period of egg-laying, by means of light traps placed among the cane (see 'Australian Sugar Journal,' Vol. VII., page 903) and emphasised the fact that the beetles directly responsible for future trouble were those which, having managed to elude capture from feeding-trees, finally visited the canefields at night time in order to oviposit. Growers are advised to look up this special report. I hope, this season, to devise some new forms of light-traps, based on the design of that figured in the above-mentioned report, but of more simple construction, with which to follow up this line of control.

"PUPÆ OF CANE-BEETLES.

"On the 22nd instant it was found that pupæ of albohirtum had pupated at Greenhills at depths of 10 to 24 in. The soil was rather dry at 6 in. from the surface, but moist and very compact lower down.

"Two small grubs of an undetermined coleopterous insect were located at a depth of 30 in. Later, on the 24th instant, pupæ at Carrah, Meringa, were unearthed at depths varying from 8 to 14 in. The soil in this case was red volcanic, similar in mechanical composition to that tested by the writer on the same estate during October, 1915. In this class of land pupation apparently takes place at an average depth of about 11 in.

"Whilst at Hambledon last May it occurred to me that the control of the pupal stage of albohirtum had never been seriously attempted, and I was interested to find that Mr. A. L. Walker had given this matter consideration, and was of opinion that fumigation with bisulphide might prove beneficial in clearing up pupa-infested land before planting same. On certain areas of grub-eaten land at Meringa I have found pupæ of albohirtum to occur at the rate of about two per stool of cane. Assuming half these pupæ to produce female beetles, and allowing a loss of 20 per cent. of these from attacks of birds and other enemies, we shall find that the beetles arising from each acre of such infested land could produce 64,000 grubs, or enough to destroy 4 acres of cane.

"Preliminary experiments this month with bisulphide against the pupæ have demonstrated that specimens placed in cages of compact soil will succumb to fumigation. Field work will be carried out shortly, and it remains to be seen, primarily, whether the lining of puddled soil spread by the grub over the walls of its subterranean pupal chamber, prior to transformation, will prove to be impervious to the fumes of carbon bisulphide.

"CANE-GRUBS EATING ENGLISH POTATOES.

"One hears suggestions from time to time regarding the advisability of planting English potatoes on our most badly grub-eaten cane lands. In this connection it might be well to mention that some time back (June, 1919) my attention was drawn to what proved to be a rather interesting case of white-grub attack occurring in a vegetable garden at Kamma, near Cairns. The grubs in question, which were none other than those of our Greyback cane-beetle, were found to be hollowing out the

tubers of half-grown potatoes of the variety snowflake that had been planted in April on a plot of greyish clay loam soil, adjoining a block of sugar-cane. In some cases the tubers were nearly consumed, the large third-stage grubs of this pest being located right inside them.

"This fact helps to further substantiate views held by the writer regarding the dietary of grubs of albohirtum.

"PARASITE OF CANE-BORER.

"Steps are being taken to breed in considerable numbers the parasitic tachinid fly (*Ceromasia sphenophori*) for ultimate distribution in canefields at Gordonvale and Babinda, wherever the weevil-borer may be found to occur injuriously.

"It is proposed to obtain specimens needed for laboratory breeding from Babinda, but, if not available from that district, Mossman will be visited."

A NEW MOTH-PEST OF SUGAR-CANE AND MAIZE.

LEAF-EATING GRASS-WORM (*Laphygma exempta* Walk.)

BY EDMUND JARVIS, Entomologist.

The presence of this insect was first notified by the writer at Meringa, near Cairns, on 18th February, 1920, on which date the caterpillars were more than half grown and causing very noticeable damage to cane leaves and young maize plants.

They swarmed literally in countless thousands over an area of about 100 acres, occurring, however, in greatest profusion on grass-covered roads and headlands.

A small patch of cane (D1135), that chanced to be weedy at the time when these moths were ovipositing, had suffered badly, large fragments having been cut out of the leaf-blades, which had in many cases been entirely devoured, leaving only the mid-rib.

Viewed as a whole from a little distance, the foliage of both maize and sugar-cane appeared ragged (fig. 3), and if the larval stage of this pest had been prolonged for another week or two the affected crops must have been eaten out.

However, three days later (21st February), the caterpillars were fully grown, and I then collected 200 specimens for experimental purposes—a mere fraction of those feeding on an area of less than a square chain. These were at once transferred to a couple of large breeding-cages (100 in each cage), and two days later had all gone under the soil to pupate.

The pupal stage occupied an interval of from seven to eleven days, the first moth making its appearance on 1st March, while during the next five days a total of forty-one moths emerged, viz., twenty-five males and sixteen females. From these 200 larvæ, only 20.50 per cent. arrived at the moth stage. A tachinid fly parasitised 33.50 per cent., and hymenopterous parasites 1 per cent., the remaining forty-five larvæ succumbing, presumably to some obscure bacterial disease.

The following notes from my diary may be of interest, as showing the dates and order in which these moths and parasites emerged:—

INSECTS DERIVED FROM PUPÆ OF 200 LARVÆ OF *Laphygma exempta*; COLLECTED 21ST FEBRUARY, 1920.

1st March	1 moth (male)	1
2nd March	13 moths (8 male, 5 females)	13
3rd March	21 moths (14 males, 7 females)	21
4th March	3 moths (1 male, 2 females)	3
4th March	2 tachinid parasites	2
4th March	1 ichneumon parasite	1
5th March	3 moths (1 male, 2 females)	3
6th March	7 tachinid parasites	7
7th March	4 tachinid parasites	4
8th March	20 tachinid parasites	20
9th March	10 tachinid parasites	10
10th March	18 tachinid parasites	18
12th March	6 tachinid parasites	6
17th March	1 ichneumon parasite	1
		110

The occurrence of this moth in Queensland canefields is of scientific interest, and has not, I believe, been previously recorded.

Dr. Turner was kind enough to identify the species, from specimens bred by the writer.

It would appear to take the place here of the notorious grass-worm (*Laphygma frugiperda* S. & A. that so often attacks cane and cereal crops in other parts of the world.

Laphygma exempta Walk. is a native of Africa, where it is known as the "swarming caterpillar," and is destructive to maize, millet, kaffir-corn, oats, wheat, barley, and potatoes.

DESCRIPTION OF CATERPILLAR (FROM CANE AT MERINGA: FIGS. 2, 3, 4).

General colour dark-brown, with mid-dorsal, two sub-dorsal, and a band below spiracles pale-yellow. Spiracular-band, and area between yellow stripes light-brown or dull brownish-black, irrorated with short yellow lines, blotches, and dots. Prothoracic collar uniform brownish-black with three white stripes. Head reddish-brown; eyes lighter, and indistinctly mottled with yellow; a large white V-shaped mark on face, bordering inner edges of eyes. A large somewhat-raised yellow blotch close to posterior edge of each abdominal spiracle. Ventral surface of body light yellowish-green, dotted with white or brown on area between legs and lower spiracular band. Legs and claspers yellow, the latter with pinkish tips. Length of caterpillar about 25 mm. (1 inch).

Some of the larvæ noticed were grass-green in colour, with the above-mentioned markings and stripes pale-yellow.

HABITS OF THE CATERPILLAR.

Whilst crawling over bare ground its movements are quick and erratic. The larvæ feed openly in the sunshine on cane leaves, fully exposed to view, as many as a dozen caterpillars being found by the writer on a single small sucker about 1 ft. high. This habit distinguishes them at once from larvæ of the common "army-worm," *Cirphis unipuncta* Haw., which feed mostly at night, and hide during the day among the unfolding heart-leaves of the cane.

The caterpillars of *L. exempta*, when approached closely or touched, usually fall to the ground and remain motionless for a few seconds before crawling away.

DESCRIPTION OF THE PUPA.

Dark red-brown; the legs, wings, body segments, &c., outlined in blackish; hind margin of abdominal segments 4, 5, 6 reddish-black; frontal half (above spiracles) of segments 4 to 7 punctulate; end of anal segment obtuse, with two terminal short stout spines; stigmata dark, rather large, ovate, and prominent. Length of pupa about 15 mm. (five-eighths of an inch).

DESCRIPTION OF MOTH. (BRED FROM CANE AT MERINGA.)

Female.—Head and thorax dark grey ochraceous, the former with purple-black eyes crossed by a few golden lines; the latter tufted behind with long pinkish-grey scales. Abdomen light silvery-brown. Fore-wings dark grey ochraceous, two indistinct waved lines enclosing central area, three or four short longitudinal streaks near outer margin, and a row of about eight blotches on outer edge of wing deep-brown. Hind wings pilose, pale whitish-yellow shot with light rose-pink; the costal margin with darker scales; nervures, and the suffused edge of outer margin smoky-brown; fringes silvery, clouded basally with brown. Under surface of wings pale silvery-yellow; fore-wing inclined to light grey, hind wing suffused with pink. Legs dark-brown, distal ends of tarsal joints yellow. Length of body 13 mm. ($\frac{1}{2}$ in.); wing expanse of male 32 mm., of female 36 mm. ($1\frac{3}{8}$ in.).

Male.—Differs in having the fore-wings lighter grey, and conspicuously blotched with creamy suffusions, as shown in Fig. 1.

NATURAL ENEMIES OF *LAPHYGMA EXEMPTA* Walk.

Tachinid Parasite (undetermined)—

This insect closely resembles a common house-fly in size and general colouration, but differs from it in being clothed with the numerous stout bristles so characteristic of species of Tachinidæ.

Undoubtedly it is by far the most important of the parasites controlling *L. exempta*, and it is mainly through its instrumentality that the late broods of this noctuid are rendered insignificant.

On 3rd March, whilst moths were emerging freely in my breeding-cages (1st to 5th March), I visited the paddock from where the 200 caterpillars had been collected

on 21st February, fully expecting to find plenty of winged specimens, but was rather surprised to see only one moth resting on a maize leaf.

Three days later, when tachinid flies had appeared in the cages, the place was again visited, and upon arriving on the scene at 9.30 a.m. on a cloudy morning (heavy rain having fallen just before daybreak) I was interested to note the presence of an immense swarm of these useful parasites flying in leisurely and erratic manner close to the ground among grass-stems, weeds, &c., or settled on the leaves while copulating. The air resounded with a continuous hum, resembling the musical murmur produced by a swarm of bees on the wing, due to the buzzing of this countless multitude of flies; and one could not help wondering where so vast a host would ultimately breed, seeing that both caterpillars and moths of *L. exempta* were conspicuous by their absence.

Quite possibly this tachinid fly attacks larvæ of *Cirphis* and other related noctuids that occasionally invade our canefields in great numbers.

Hymenopterous Parasites—

1. *Metopius unifestratus* Mer. Description of male.—Body black, coarsely punctulate, and marked with sulphur-yellow as follows:—Face, first antennal joint, ten blotches of varying sizes on thorax, seven transverse abdominal broad bands diminishing in width towards anal segment, fore and mid-legs, and tarsal and distal portions of hind femora. Antennæ dark red-brown; wings smoky-brown, nervures dark-reddish. Length of body about half an inch.

Iphiaulax dubitorius Fabr. (male).—Body, an uniform light reddish-yellow; eyes, antennæ, distal ends of hind tibiæ, black. Wings pale-brown, the basal area and a central transverse band, yellow. Length of body about a quarter of an inch.

Both the above parasites are common here, and probably affect several kinds of lepidopterous caterpillars. The latter species was observed by the writer at Gordonvale in 1915 grossly infesting larvæ of a pyrale moth (Zinckenia), that were defoliating the weed known as "Fat-hen" (Chenopodium sp.) throughout a considerable area.

Predaceous Beetle—Ophonoides australis Dej.—Larvæ of this carabid beetle occurred in the affected area rather commonly, while the noctuid caterpillars were feeding, attacking principally those traversing the bare ground between cane stools, but also exploring the leaves at times in search of prey.

Directly one of these eminently predaceous larvæ encountered a caterpillar, it instantly buried its powerful cutting mandibles deeply in the body, near the head, and then simply hung on, while the unfortunate victim, in vain endeavouring to shake off its foe, twisted and rapidly rolled over and over convulsively.

Such struggles seldom lasted more than a minute, at the end of which time even large caterpillars seemed too weak to offer further resistance, and suffered the enemy to greedily imbibe their life-juices until its body had become greatly swollen and could hold no more.

This larvæ, which runs with agility and is exceedingly active and pugnacious, resides underground in small holes or sun-cracks.

Specimens whilst in captivity were fed on noctuid larvæ and pupæ, and soon pupated at the bottom of breeding-cages filled with damp soil.

The pupal condition during March (our hottest month) lasted only seven days; the maximum temperature at the time being about 87 deg. F.

Technical descriptions of the larval and pupal stages of this beetle need not be given here, but I may state that in general appearance the larva is uniformly black, of typical campodeoid form, and slightly exceeds half an inch in length. (See Fig. 5.)

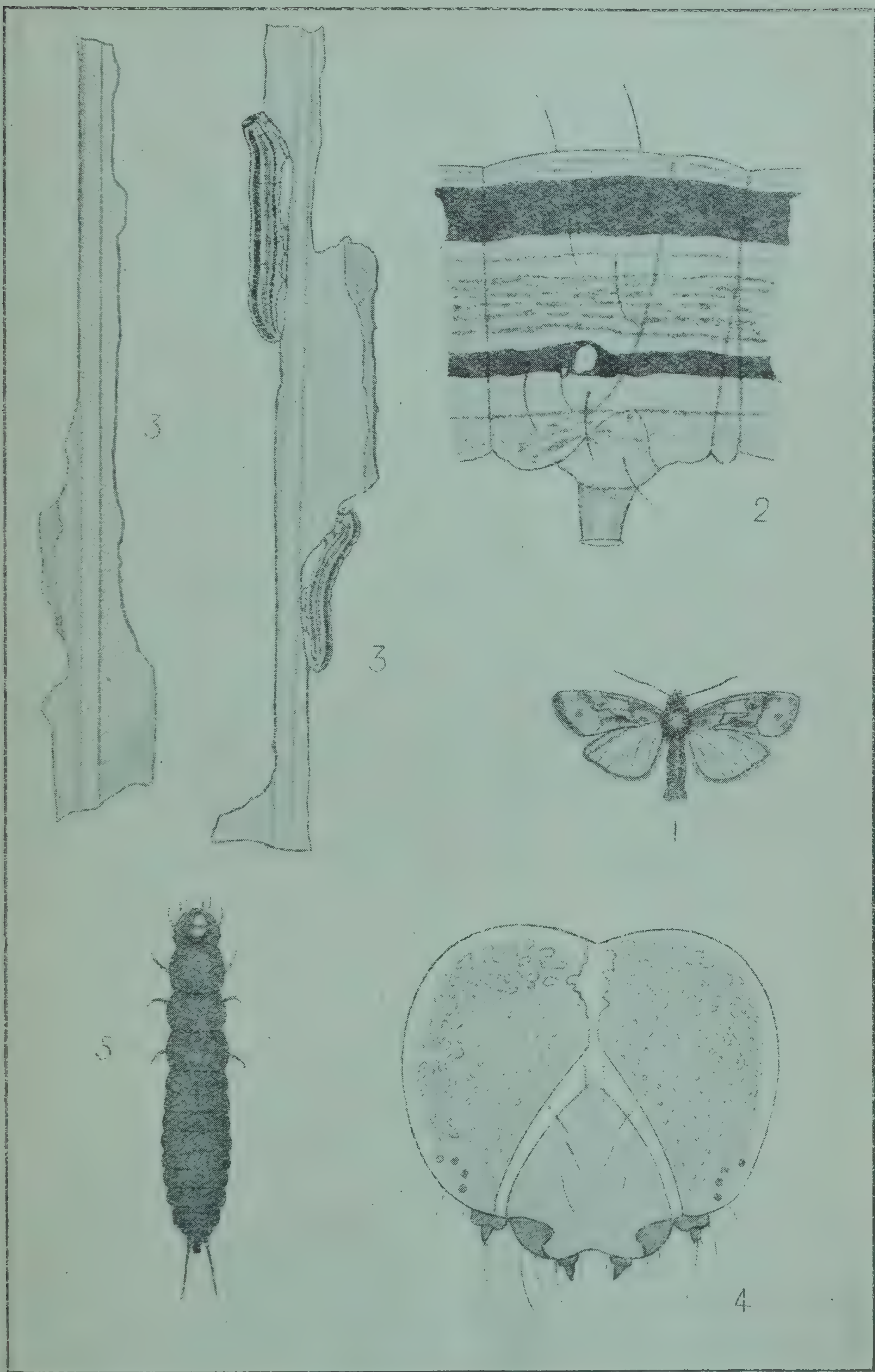
The beetle is about ⅝ in. long, with prothorax and head shining green, and deeply punctured; wing-cases dark-brown, edged with green, and often suffused with iridescent pink, each elytron with eight parallel rows of punctures. Under surface of body and legs shining black; palpi and basal joints of antennæ reddish-brown.

This insect is common in most canefields, living under clods of soil, stones, &c.; and being, like many species of Carabidæ, most active during night time, and exceeding agile, usually escapes notice.

REMEDIAL MEASURES.

In the event of this moth-pest proving troublesome in the future, it may be as well to state that action should be taken directly the young caterpillars are first noticed.

The usual procedure is to spray the herbage lying between the swarm and the crop with some poisonous solution.



E. Jarvis, Del.

Plate 62.—Leaf-eating Grass-worm (*Laphygma exempta*, Walk.)

The following formula has been recommended by R. W. Jack, the Government Entomologist of Rhodesia:—

Arsenite of soda	1 lb.
Black sugar	8 lb.
Water	10 gall.

It is considered that when an attack is concentrated on a limited area it is best to use a spray consisting of arsenite of lime to which is added 3 lb. of black sugar to each 50 gall. of water.

DESCRIPTION OF PLATE.

(*All Drawings original.*)

Fig. 1.—Moth Pest of Sugar-cane (*Laphygma exempta* Walk., male, natural size).

Fig. 2.—Side view of an abdominal segment of caterpillar, showing disposition of bands, hairs, and light spot against spiracle (magnified).

Fig. 3.—Caterpillar of *L. exempta*, on portion of damaged cane leaf (natural size).

Fig. 4. Head of caterpillar (front view); magnified.

Fg. 5.—Larva of Carabid ground-beetle; predaceous on caterpillars of *L. exempta* (magnified about three times).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING AUGUST, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Aug.	Average Rainfall. No. of Years' Records.	Total Rainfall. Aug., 1921.	Total Rainfall. Aug., 1920.	Divisions and Stations.	Average Rainfall. Aug.	Average Rainfall. No. of Years' Records.	Total Rainfall. Aug., 1921	Total Rainfall. Aug., 1920.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	0·89	20	0·92	0·43					
Cairns	1·82	39	1·44	0·33	Nambour	2·06	25	1·63	1·56
Cardwell	1·34	49	1·38	3·93	Nanango	1·49	39	0·45	2 21
Cooktown	1·40	45	0·97	0·14	Rockhampton ...	1·02	34	2 66	1 52
Herberton	0·70	34	0·61	1·41	Woodford	1·92	34	1·07	1·01
Ingham	1·43	29	1 82	1·50					
Innisfail	5·41	40	3·74	2·07					
Mossman	1·40	13	0·79	1·49	*Darling Downs.*				
Townsville	0·48	50	0·16	1·62					
					Dalby	1·28	51	0·37	1·69
Central Coast.					Emu Vale	1·26	25	0·36	1·53
					Jimbour	1·34	33	0·94	1·69
Ayr	0·56	34	0·41	2·53	Miles	1·26	36	0·60	1·47
Bowen	0·73	50	0 35	2·59	Stanthorpe ...	1·92	48	0·18	2·02
Charters Towers ...	0 54	39	0 64	1·35	Toowoomba ...	1·81	49	0·84	1·89
Mackay	1·08	50	0 91	3 27	Warwick	1·56	34	0·50	1·84
Proserpine	1·31	18	3·73	3·57					
St. Lawrence ...	0·93	50	0·62	2·53	*Maranoa.*				
					Roma	0·99	47	0·83	1·48
South Coast.									
Biggenden	1·21	22	1·59	0·87					
Bundaberg	1·42	38	0·85	1·45	*State Farms, &c.*				
Brisbane	2·17	70	0·41	1·16					
Childers	1·30	26	1·45	1·42	Bungeworgorai ...	1·04	7	0·69	1·45
Crohamhurst ...	2·43	25	1·45	1·39	Gatton College ...	1·30	22	0·22	1·32
Esk	1·66	34	0·54	1·54	Gindie	0·81	22	1·05	1·32
Gayndah	1·27	50	0·59	1·41	Hermitage ...	1·54	15	0·27	2·06
Gympie	1·89	51	1·30	1·52	Kairi	1·19	7	...	1·82
Glasshouse M'tains	1 68	13	1·45	0·67	Sugar Experiment Station, Mackay	1·00	24	0·64	3·21
Kilkivan	1·61	42	1·05	1·90					
Maryborough ...	1·80	50	1·02	1·90	Warren	1·14	7	1·31	2·11

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for August this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Editorial Notes.

Efficiency in Dehydration.

Dehydration continues to hold the attention of fruitgrowers and, though interest does not slacken, a tendency to receive with caution accounts of successful processing and claims for the efficiency of various systems is very noticeable. The wisdom of closely investigating every claim advanced on behalf of any particular type of dehydrator, and analysing every factor making for efficient and economical production, is obvious to every thoughtful producer. A study of the industry, which in Queensland is still practically in embryo, at the present stage of its development will show that its future depends upon four primary factors—standardised production of the highest possible quality; efficient and economical production; an organisation as effective, at least, as those controlling fresh, canned, and sun-dried operations; and a liberal publicity and demonstration campaign. Mr. Arthur W. Christie, Instructor in Fruit Products, University of California, discusses at length the second of these factors in a paper read before the Second Dehydration Convention at Fresno, California, the proceedings of which have been published as a bulletin by the Californian Department of Agriculture. Californian experience and accounts of experiments are of especial value to Queensland fruitgrowers at this juncture, and the embarking upon any scheme or the acceptance of any particular system of dehydration should be preceded by the fullest investigation. It is not possible, in this issue, to completely review the paper referred to, but the subjoined extract, weighted as it is with sound sense, will indicate its general trend:—

"The past season afforded ample opportunity for careful study of the various types of dehydrators in operation, as well as the methods in vogue for handling of fruit before and after dehydration. As might be expected, some types of dehydrators and methods of operation showed decided superiority over others. In obtaining reliable data on the different systems for the dehydration of fruits, it was soon found impossible to accept, in many cases, the statements of manufacturers, owners, or operators. Reliance must be placed on carefully controlled tests made during the operation of the dehydrator under normal conditions. The dehydrator enthusiast seems closely related to the automobile fan who proudly informs you that his car climbs all hills on 'high,' can travel so many miles to the gallon of gasoline, and never was in the repair shop. Just as the condition of weather and roads, the load carried, and the skill of the driver all affect the performance of an automobile, so does the quantity and condition of fruit, the nature of the weather, and the experience of the operator, all affect the efficiency of a dehydrator. Although there is still much need for investigation, the data accumulated during the past season have materially clarified our ideas concerning proper construction and operation of dehydrators."

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Cassaba Seeds.

Through the generosity of two subscribers, who received Cassaba seeds through this Department for last season's sowing, we are now able to supply every applicant on our waiting list.

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Standardising, Advertising, Stabilising.

Queensland's great capacity for fruit production is every season amply proved, and the necessity of sound business organisation at the commercial end of the growers' enterprise becomes every day more evident. Standardisation of products, wide and judicious advertisement, and stabilisation of markets have become of first importance to producers generally, and more particularly to those engaged in the fruit industry. The fact that first-grade Queensland bananas are at present being marketed in the Southern cities as "Fiji bananas," notwithstanding that importations from Fiji have absolutely ceased, illustrates boldly, in one branch of primary industry alone, the clamant need of well-organised and effective publicity in respect to Queensland's products. Australians should naturally, through the bounty of Nature, be a fruit-eating people, and there exists a boundless field for intelligently directed co-operative effort under the three headings suggested. The producer knows what his land can

produce, conditions governing production, and generally how production may be improved. His present problem is how and where to find satisfactory markets for what he does grow. As an effort to add to general information on proved essentials of successful marketing, co-operative and otherwise, the first of a comprehensive series of articles on the selling side of primary industrial enterprise will appear in our next issue.

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Two Important Measures. The Regulation of Sugar Cane Prices Acts Amendment Bill and the Banana Industry Preservation Bill, two very important measures, were submitted to Parliament in the course of the month. Each, if finally approved by the legislature, will have far-reaching beneficial effect in two of our most important rural industries.

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The Cane Prices Acts Amendment Bill. "My sympathies are with the grower all the time, and this legislation was introduced purely and solely to protect the grower." The Minister for Agriculture, Hon. W. N. Gillies, indicated in this remark the main purpose of the Bill. From the viewpoint of national defence and the preservation of the White Australia ideal, canegrowing is the most important agricultural industry in the State, and any measure for its protection and advancement will meet with general approval. The Bill embodies the recommendations of a conference of representatives of the Australian Sugar Producers' Association, the United Cane Growers' Association, and the Chairman of the Central Sugar Cane Prices Board. The beneficial effects of the original 1915 Act and the Amending Act of 1917 are already well known. The canegrower has now a voice in fixing the price of his product, mill deliveries are regulated, the quality of the cane is determined, no indiscriminate deductions may be made, unjust penalties cannot be enforced, payment by analysis is, in nearly every instance, secured, knowledge of profitable varieties is ascertained as the result of an established system of analyses, mill allotments can be organised equitably, mediation in disputes is largely simplified, and compulsory crushing can, in the Minister's discretion, be enforced. The new Bill further safeguards the interests of all concerned in the industry. Perhaps the most important departure in the new measure is in Clause 17, which empowers growers and millers to enter into agreements for a term of years, with a safeguarding provision to the effect that 85 per cent. of the growers must ask for it, and it must be ratified by the Central Cane Prices Board. Power is also given the Central Board to exempt mills from crushing under certain circumstances. Clause 19 provides for appeals from decisions of police magistrates to the District Court judge who is chairman of the Central Board, or to another judge appointed for the purpose. Most of the other amendments clarify sections of the Act and make them more effective and renders their administration more efficient.

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Banana Industry Preservation Bill. "If there is a protective duty put on bananas it will have the effect of causing coloured labour to engage in the industry. The growers, therefore, have urged me to introduce legislation to keep the industry as 'white' as it is at the present time. . . . It is not the intention of the Government to interfere with any person who is engaged in the industry at the present time. It is desired to get this legislation on the statute-book as quickly as possible, because we have received information that Chinese are buying up land in Queensland and contemplate going in for banana cultivation. They are gradually going in for banana-growing in Queensland again; and just over the border, in New South Wales, the Chinese growers are increasing to an alarming extent." These remarks of the Minister for Agriculture, in introducing the Bill, epitomise its main purpose. Under the protection accorded by the Federal authorities banana-growing in Queensland must expand, and the Bill provides for the full engagement of white people in the industry. The banana is a valuable article of diet, and it is hoped and expected that, as a result of the increased tariff, a very important industry will be built up in this State. It is an industry returned soldiers can engage in, and the Bill provides for, as far as possible, keeping it "white." The most effective are Clauses 3 and 5. Clause 3 provides for the application of the dictation test; and Clause 5 gives power to make regulations, *inter alia*, for the granting of certificates to persons who have passed the dictation test and for the exemption from the Act of any person or class whom, for any reason, it is not considered necessary to examine.

General Notes.

PUBLICATIONS RECEIVED.

The International Review of the Science and Practice of Agriculture (Rome) for June surveys the world's activities in every branch of agriculture. In a reprint from the *Revista de Agricultura* the influence of fertilisers on the combustibility of tobacco is described. Results of Cuban experiments are tabulated, and, in the course of an account of the influence of each fertiliser used, the author (Moreno, Chemistry Chief, Agricultural Experiment Station, Cuba) draws the following conclusions:—(1) Double superphosphate, sulphate of ammonia, and potassium sulphate increase the combustibility of tobacco. (2) Calcium cyanimide should only be used in small amounts, because larger proportions produce toxic effects. (3) Sulphate is the best potassic fertiliser; the proportion can be increased with advantage to combustibility. (4) Manufactured tobaccos which burn the best are those of homogeneous composition, those with a small bulk and light colour being preferable.

The Boletin de Agricultura, Industria y Commercio (Guatemala), No. 2, 1921, contains an interesting description of the cultivation of vanila.

The Aberdeen Angus Review (June) has much information on "the premier beef breed of the world," and is of particular interest to cattlemen.

The American Bee Journal for July has some interesting notes on the control of the waxmoth, and on early beekeeping history.

Gardening and Country Life (South Africa) for September features a valuable article on chrysanthemum culture.

The Journal of the Department of Agriculture, Union of South Africa, for August continues a discussion on fodder and pasture grasses of the Union, with special reference to Rhodes grass. "The Castration of Animals with 'Burdizzo Pincers'" is another useful contribution.

The Rhodesia Agricultural Journal (August) has among its leading features, "Farm Butter Making," "Crop Rotation and Mixed Farming," and "Ticks Infesting Domestic Animals."

The Agricultural Gazette of New South Wales (September) continues its interesting series of reports on farmers' experimental plots. Its other features include the concluding article on "Producing Lucerne Hay under Irrigation Conditions" (F. G. Chomley and F. Chaffey), "An Affection of the Mouths of Sheep" (S. T. D. Symons), "The Value of Soil Analysis to the Farmer" (F. B. Guthrie and R. M. Petrie), "Methods of Maize Breeding for Increase of Yield" (H. Wenholz), and the concluding paper on "Co-operation for Farmers" (C. C. Crane).

The Handbook of Horticulture and Viticulture of Western Australia (3rd ed., 1921) by A. Despeissis, M.R.A.C., is brought out as a result of "the increasing demand and the fresh stimulus given to land settlement under the Scheme for the Repatriation of Returned Soldiers." It is a comprehensive and valuable work.

The Journal of the Department of Agriculture of South Australia (August) includes among its more important topics "National Schemes for the Improvement of Live Stock" (W. J. Colebatch).

The Tropical Agriculturist (Ceylon) for July contains a full account of the 1921 tractor trials in Ceylon, and some particulars of Adlay—a new grain. "Adlay is a coarse, annual grass, with hard, bead-like and shining grain. . . . An interesting plant in itself, it is of but little economic value."

The Hawaiian Forester and Agriculturist for June has an interesting note on the comparative value of split and round fencing posts. "The Forest Products Laboratory of the United States Department of Agriculture says that one will last as long as the other if the percentages of heartwood and sapwood are the same in both. If the percentage of sapwood is increased by splitting, the split post will be less durable, while if the percentage of heartwood is increased it will be more durable than the round one. . . . If the posts are to be treated with creosote or some other preservative, the round post is preferable to the split, because of the comparative ease with which the sapwood can be treated."

The Agricultural Gazette of Canada (July-August) has some interesting notes on the development of markets and inspection and grading of produce.

Safeguarding Farm Stock from Disease is an important bulletin by Max Henry, M.R.C.V.S., B.V.Sc., issued by the Department of Agriculture and Stock of New South Wales.

Answers to Correspondents.

BACON-CURING.

"Digger's Wife" (Mackay).—There are various methods of curing bacon, and the one for dry curing described hereunder is favoured by many:—

For every 100 lb. of meat take 3 lb. of coarse salt, 2 lb. of brown sugar, 1 lb. of allspice, 2 oz. saltpetre well powdered, and 1 oz. carbonate of soda; mix well together. If the other ingredients are not available, salt and sugar in equal parts, with a little saltpetre, will give good results. If possible, rub the meat first with 1 lb. of honey for every 100 lb. of meat. Then rub with about two-thirds of the preparation until it begins to stick well, which is generally in about seven minutes. The first two days' rubbing is the most important, and unless the meat cures then it is not in a suitable condition. After such rubbing, stack the meat in a tank, first putting a thin layer of salt at the bottom; a layer of sides is put on this with the rind downwards, then another layer is crossed on this, and so on until all the bacon has been put in. After twenty-four hours, turn and rub again, adding a little more of the unused mixture, after which turn and rub once in every forty-eight hours, using a little more of the mixture each time. Place the sides which are on the top to-day on the bottom to-morrow, and so on. After twenty-one days in pickle, it is ready for washing, drying, trimming, and smoking.

Place in water just warm enough to bear one's hand in, and then brush over with a dandy brush, which removes all fat, sugar, slime, &c. Then place in a tank with clean, cool water, for twenty-four hours. This takes the surplus salt out, and renders it mild-cured bacon. Afterwards hang up in a dry place where there is a good draught. If the days are fine and dry, with a slight breeze of wind, the bacon is generally sufficiently dry in about a week.

In trimming the bacon the sharp points of the rib-bones are sawn off, and the remaining part of the fore leg also sawn off level with the shoulder. The knife is then run over the belly part of the rib-bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance.

SMOKING.

It is then ready for the smoke-house. The walls of the house should be 12 feet high, and the smoke should be conducted to the bacon as cool as possible. Hang the meat close to the top, in rows about 6 inches apart. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour. Hardwood sawdust, damp maize-cobs, branches of eucalyptus free from all traces of gum, or stinkwort gathered with the sap in it and stored till dry, make excellent smoke. Light a small fire on the floor of the smoke-house, and place on it a few handfuls of sawdust. Then lay a sheet of galvanised iron on top, which will cause the fire to smoulder and produce smoke only. About 3 feet above this suspend another piece of galvanised iron, so as to prevent any heat from the fire reaching the bacon. After they leave the smoking-house, it is well to go over the hams and hands with lard and pollard and stop up any place that is likely to be attacked by flies. Finally, place the hams and hands in calico bags, taking care to tie them tightly at the top, and hang them from the ceiling until the weather gets warm. They can then be packed away in perfectly dry bran or sawdust, and should be taken out every six weeks and examined. If there should be any trace of mildew or sweating, it should be rubbed off with a cloth, and a little chaff added to the bran or sawdust. Keep as far as possible an even temperature. Too much heat will cause the fat to melt and turn musty, and if too damp it will sweat and decay. By curing and treating bacon in this way an article can be obtained which will always command a good price and will keep for many years.

ALGAROBA SEED.

W. Brotherton (Brothertonville, Gladstone) advises that the whole of his stock of algaroba seed has now been distributed.

CAROB BEAN.

J. W. Jackson (Fitzroy Farm, Etna Creek, Rockhampton) writes:—

"*Carob Bean.*—Some years ago I planted three seeds, from which I have got two trees. They grow all right here, but have not yet come into bearing. I had to transplant the bigger one, as it was growing too close to a citrus tree. Anderson and Co.'s (Sydney) catalogue gives particulars as to seed supplies and prices, which would interest intending growers."

TREE IDENTIFIED.

John Locke (Mackay).—The Government Botanist, Mr. C. T. White, F.L.S., to whom your specimen was submitted, advises as follows:—

"The specimen sent is *Grevillea Hilliana*, a tree closely allied to *Grevillea robusta*, as suggested. It is a native of the scrub country of Eastern Australia, from the northern parts of New South Wales to about the Bowen district. In New South Wales it sometimes goes under the name of the White Yiel Yiel, but I have not heard a vernacular applied to it in Queensland. The specific name *Hilliana* is in honour of Walter Hill, the first Government Botanist of Queensland and Director of the Brisbane Botanic Gardens."

RATIONS FOR PIGS.

H. B. Barnes (Caboolture).—

(1.) Examples of rations for pig-feeding will be published in next issue.

(2.) *Weaners.*—Note remarks in paragraph 2, page 4, of "Pig Raising in Queensland," by E. Graham and H. C. Quodling; also on page 22, under the heading "Weaners and Slips." Weaners of the age mentioned, 9 weeks, can be reared without skim milk, provided the food is easily digestible, of a suitable nature, and given more in the form of gruel by boiling pollard and maize-meal with approved waste food from the house. Better results, however, will be attained by adhering to advice given in respect to the use of skimmed milk and dairy by-products.

MARKET INFORMATION—BANANA INDUSTRY—SUGAR INDUSTRY.

C. H. D. P. (Spring Hollow, Yeppoon).—

MARKET INFORMATION.

A monthly publication is seldom recognised as a suitable medium for market information as, to be of value, it must, obviously, be both accurate and timely. The Journal cannot reasonably be expected to assume the functions of a daily or weekly newspaper.

BANANA INDUSTRY.

The imposition of the duty on imported bananas was primarily due to the action of the Queensland Department of Agriculture and Stock, and the Bill now before Parliament, introduced by the Hon. W. N. Gillies, Minister for Agriculture, and which provides for the preservation of the banana industry and other incidental purposes, is a natural corollary of the further action taken by the Federal authorities.

SUGAR INDUSTRY.

Sugar-growing is the most important agricultural industry in the State, upwards of £15,000,000 being invested in it, and it is not considered that too much space is being devoted to it in the Journal.

SCOTCH THISTLE (CARDUUS LANCEOLATA).

INQUIRER—

The Director of Agriculture, Mr. H. C. Quodling, advises as follows:—

"Thistles should be cut off below the surface of the ground to kill them outright. No doubt quantities of seed have been deposited on the ground, and these will commence to grow at the first favourable opportunity. If it is possible to mow these thistles regularly they can be temporarily kept in check, and in this way the grass will be given a chance to flourish. Thistles usually choke themselves out in the course of two or three seasons, but in this case they will have effected a great deal of damage in the meantime."

COTTON SEED AS A STOCK FOOD.—TOBACCO AND LUCERNE SEED.

COTTON SEED AS A STOCK FOOD.

G.H.B. (Glass House Mountains)—

If you refer to the remarks on the value of cotton seed as stock food in the July issue, you will note that no mention is made of it as pig feed. Though beneficial to cattle and sheep, cotton seed should not be fed to pigs. Cotton seed crushing in an ordinary corncracker is necessarily a comparatively slow process, owing to its tendency to clog in the machine. An adjustment of the rollers might relieve the difficulty. Hard maize crushed with the cotton seed would help to keep the rollers free.

TOBACCO AND LUCERNE SEED.

Tobacco seed is obtainable from the Department of Agriculture and Stock at 3s. 6d. per oz., postage paid. Varieties on hand are:—*Cigar*—Connecticut, Cuban, and Connecticut Havana; *Pipe and Cigarette*—Broadleaf Gooch, Blue Pryor, and Sweet Orinoco. Lucerne seed is obtainable from any seedsman.

TREATMENT FOR DOGS, FOALS, AND CALVES AFFECTED WITH "SCRUB" TICKS.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Scrub ticks cause a great deal of trouble to stockowners in certain districts, with a large percentage of mortalities. It has been stated that these ticks do not harm the animals during the first four days' attachment, so it is recommended that where scrub ticks are prevalent, valuable animals should be thoroughly examined every second or third day.

It has been proved that trypan blue, injected under the skin, is a specific for this disease in the dog; the paralysis soon improves, and in a few days the animal thoroughly recovers. One dose of the trypan blue is usually sufficient.

A 2 per cent. solution (about 9 grains to a fluid oz. of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel, in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The hypodermic syringe and needle, before being used, should be placed in a dish containing cold water, then placed over the fire and the water boiled for some ten minutes. This thoroughly sterilizes the syringe and needle, which is now ready to use when the solution to be injected has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder. The skin in these positions being loose, a fold is easily caught up by the finger of the left hand, whilst the needle is inserted with the right hand. It is advisable to clip off the hair and disinfect the spot chosen before introducing the needle.

A dose for dogs, according to age and size, varies from 1 to 5 drachms or 1 to 5 teaspoonfuls.

The dose for calves and foals, according to age and size, varies from ½ oz. to 2½ oz., or 1 to 5 tablespoonfuls.

Farm and Garden Notes for November.

FIELD.—Unless untoward weather or other conditions interfere with field operations during the latter part of October, most of the wheat in the Maranoa will be harvested by the first of this month, and harvesting operations extended to the South-Western Line, and then on to the Downs.

Farmers are commencing to realise that quick maturing wheats which possess a degree of rust resistence are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plant. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kafir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghum have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COAST DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools beings overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely-ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account we allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young pawpaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first

appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit, it appears to be covered with a grey dust, and if the fruit is examined with a good lens it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early-ripening peaches or other fruits that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruits profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully and, on its first appearance in a district, all ripening fruits should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	September.		October.		November.		December.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5·51	4·53	6·10	4·46	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6·13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5·40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5·6	5·59	4·47	6·22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queenslan New South Wales, and Victoria, where the clock time is identical).

			H. M.
2 Sept.	●	New Moon	1 33 p.m.
9 ,,	☾	First Quarter	1 30 p.m.
17 ,,	○	Full Moon	5 20 p.m.
25 ,,	☽	Last Quarter	7 18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10 26 p.m.
9 ,,	☾	First Quarter	6 12 a.m.
17 ,,	○	Full Moon	9 0 a.m.
24 ,,	☽	Last Quarter	2 32 p.m.
31 ,,	●	New Moon	9 39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1 54 a.m.
15 ,,	○	Full Moon	11 39 p.m.
22 ,,	☽	Last Quarter	9 41 p.m.
29 ,,	●	New Moon	11 26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11 20 p.m.
15 ,,	○	Full Moon	12 50 p.m.
22 ,,	☽	Last Quarter	5 54 a.m.
29 ,,	●	New Moon	3 39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Agriculture.

NOTES ON AGRICULTURAL DEVELOPMENT, CENTRAL DISTRICT.

BY G. B. BROOKS, Instructor in Agriculture.

Occasionally one hears a remark to the effect that conditions in the Central District are generally unfavourable for farming, and that agriculture is not likely to become an important industry. Fortunately, this view is invariably given expression to by those who, in regard to the conditions obtaining, have little or no knowledge.

Should evidence be required of the development that has recently taken place, one has only to peruse a map dating back a few years, when it will be found that our closely settled districts, such as Barmoya, Mount Larcom, Dawson Valley, Ridgelands, Marlborough, Boyne Valley, Targinnie, and Rosslyn are not placed.

It must be admitted that the settlers in some of the districts mentioned have had to face some adversity but it must also be remembered that during recent years the seasons along the eastern seaboard of Australia have been rather erratic, and the man who embarked on the land with little or no capital naturally had a hard row to hoe. Moreover, it is a well-recognised fact that newly populated districts are invariably handicapped through a large proportion of the settlers having had no previous knowledge of agriculture; also that it takes a district, even given the most favourable seasons, a few years to gain momentum. Several of the abovementioned sub-districts have reached what may be termed the well-to-do stage; others are about to enter, while a few which have just recently been put on the map are still in the pioneering stages.

Experienced farmers in the respective localities have already disproved the statement that these closely populated areas are outside the safe limit for successful crop production, and have demonstrated in no uncertain manner that conditions of soil and climate are equally favourable to those obtaining in other portions of the State. Those tests have not been carried out on garden patches, but on a fairly extensive scale. I can, for example, name a farmer who has, during a single year, raised over 100 acres of English potatoes; another, 500 acres of maize; while in another district there is a single patch of 100 acres of cotton being planted.

Dairying as an industry is certainly destined to assume a position of very great importance in the near future. During recent years tremendous areas of scrub have disappeared, and in its place are waving fields of Rhodes grass.

A feature invariably overlooked in connection with dairying in Central Queensland is the absence of extremes in temperature. It is, therefore, infinitely easier to keep animals in good condition and returns from the factory at a higher level than would be the case were the herds exposed to heat waves during the summer or cold westerly winds during the winter months. The fact that Central Queensland has carried off champion honours in the District competitions at the National Show, Brisbane, both in regard to agricultural products and fruit, and that it so far has been the only district in Queensland to enter the lists against those of the mother State, at the Sydney Royal, is an indication that its agricultural possibilities cannot altogether be ignored.

There are several important industries in process of development in Central Queensland that will eventually have a direct bearing on agricultural expansion by providing local markets for farm produce. Enormous deposits of high-quality metalliferous ores, coal, marble, limestone, and other minerals must eventually support a huge industrial population. The famous Mount Morgan gold and copper mine exists within its boundaries; the whole district is well served by railways; and on its coast is one of the finest harbours on the Australian seaboard.

These notes are the first of a descriptive series on the agricultural areas and possibilities of this well-endowed district, and the order in which localities are mentioned has no relation to their importance.

WOWAN DISTRICT.

The closely settled area of country extending from Dululu to Rannes, drained by the Dee and Don Rivers, has, by its proximity to the Dawson Valley Railway Line, been erroneously named "the Dawson Valley district." The Dawson River, by the way, is some 40 miles distant.

Before the advent of the railway, Dundee (now Deeford), rather prettily situated on the banks of the Dee, was the only township in those parts, but, having failed to find favour with the railway surveyor—no doubt on account of adjacent low-lying country subject to flooding—the neighbouring railway station, Wowan (native name for scrub turkey), became the centre.

When it is considered that only a few years ago the district was portion of a cattle run, the progress made has been remarkable. In Wowan most of the activities essential to an agricultural district are represented.

Physical Characteristics.—The greater portion of the district is of a gently undulating character. It is bounded on the west by the Dee Ranges, and watered by two rivers—the Dee and the Don. There are also several creeks, the most important being Alma, Pheasant, and Callide. The Dee River was brought before public notice a few years ago by the sensational finding of large nuggets of gold near its source. Towards the south-eastern portion of the district there are two fairly large stretches of water—Lake Caroline and Lake Victoria.

Although not generally known, there are large quantities of limestone in the district, the deposit running parallel with the Dee Ranges, while lime in a granular or earthy condition is also to be found in immense quantities. Samples secured from various localities and submitted for analysis show calcium to be present equal to 60 per cent. carbonate of lime. Marble has also been located in places, but the extent of the deposit has not been determined.

Climatic Conditions.—The average annual rainfall for the district is in the neighbourhood of 30 inches. Several comparatively dry seasons, which, by the way, were more severe in other parts of the State, were experienced subsequent to the opening of the land for settlement. This put a very heavy strain on the financial resources of the settlers, most of whom were depending entirely on the maize crop as a means of support. During the first year very extensive areas of scrub were cut down, mostly adjacent to the main roads. This was all practically burned off and planted with maize about the same date. Unfortunately, when at the critical stage, a hot, dry spell adversely affected the entire crop. Better fortune was experienced in following seasons.

Soils.—The Wowan district is particularly fortunate in its soils, both in regard to quality and the large proportion of land that is available for cultivation; in fact, on a great many farms practically every inch is fit for the plough.

To the east of the Dee, where the country was originally timbered with brigalow, the soil is a brown friable loam of excellent quality. Adjacent to Alma Creek there are large stretches of alluvial forest flats on which are to be found growing lucerne, maize, cotton, and other crops.

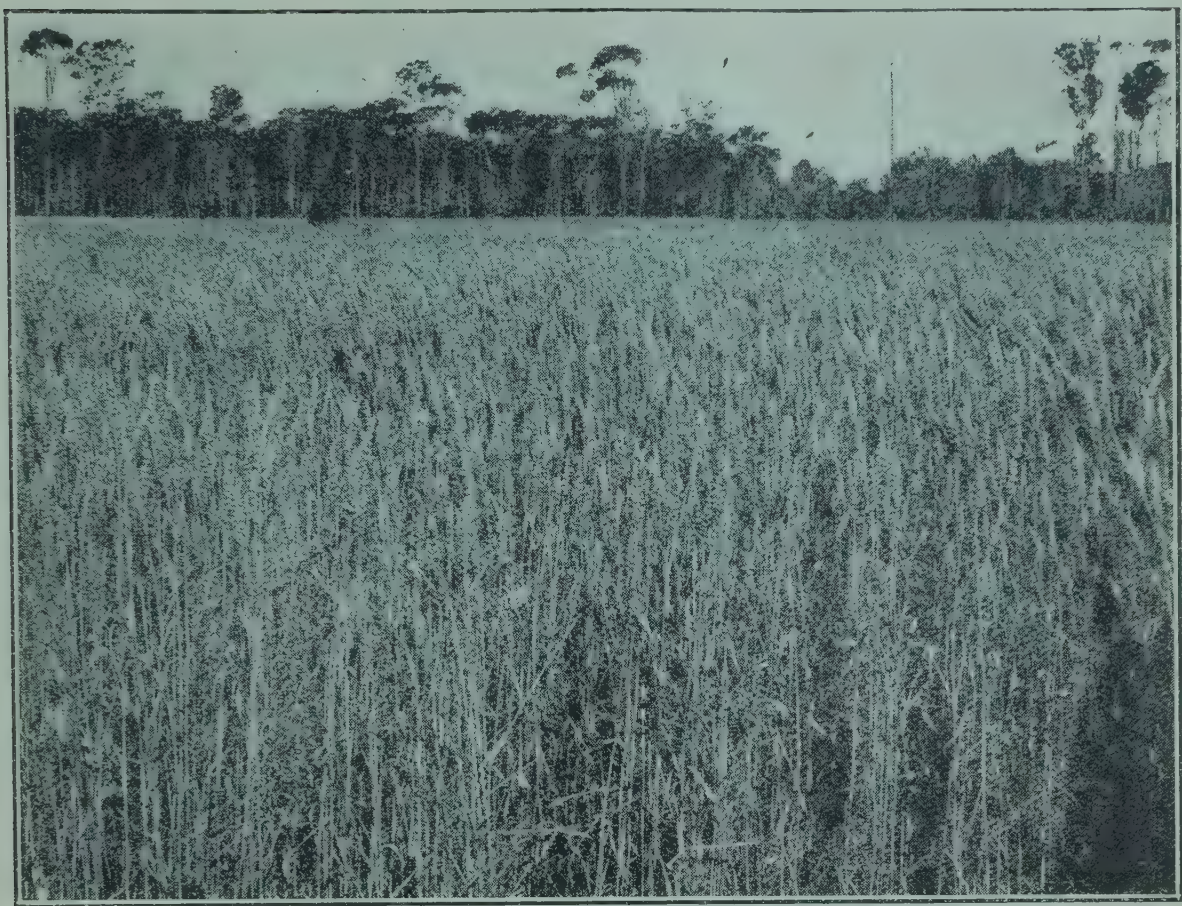


PLATE 63.—FODDER DEMONSTRATION PLOTS ON FARM OF A. E. G. BARNARD, WOWAN. VARIETY, PATRIOT WHEAT.

PLATE 64.—WOWAN, DAWSON VALLEY: A RAPIDLY GROWING DAIRYING CENTRE.

PLATE 65.—FODDER DEMONSTRATION PLOTS, A. E. G. BARNARD, WOWAN. VARIETY, FLORENCE WHEAT.

PLATE 66.—PROMISING CROP OF BROWNELL POTATOES, TAKEN SEVEN WEEKS AFTER PLANTING. GROWN BY E. C. VALLIS, DOUBLE CREEK, DEEFORD.

PLATE 67.—A PROLIFIC COTTON PLANT, DURANGO VARIETY, GROWN IN WOWAN DISTRICT

Between the Dee River and the railway line, and extending from Dululu to the junction of the Don, the soil is mostly of an alluvial nature. From the railway to the Dee Ranges, which includes the Pheasant Creek district, the country is of a more variable character, and is made up principally of brigalow and softwood scrubs, interspersed with patches of forest, timbered mainly with gum, ironbark, and bloodwood.

To the south of the Don, where it junctions with the Dee at almost right angles, there is an immense stretch, consisting of thousands of acres of rich alluvial flat country, large portions of which are excellently adapted for the raising of lucerne, potatoes, and other valuable products. The distance to the railway, from 10 to 12 miles, has no doubt retarded development; also the fact that there are low portions which, during heavy floods, would probably be subject to inundation.

Lines of Development.—With the majority of settlers the chief objective is dairying. The procedure therefore has been the falling of the scrub, cropping with maize, and seeding down in Rhodes grass. That those interested are not lacking in enterprise is shown by the erection of a co-operative butter factory at Wowan. This industry has been somewhat handicapped through the difficulty in obtaining, owing to the distance from old-established dairying centres, the type of dairy animal desired. Stock from high-producing herds are, however, gradually being brought into the district.

Hitherto the principal crop raised has been maize, but the guaranteed price of 5½d. per lb. for cotton in the seed has been an incentive to increased production of that product. Last season the area under cotton was approximately 230 acres, the return from which brought into the district over £4,300 in hard cash. This gives an average yield per acre of 800 lb., valued at £18 10s. The returns given may be considered very satisfactory, more particularly when, in many instances areas were planted too late in the season to ensure a full crop.

There has been a considerable increase in the area sown for the 1921-2 crop, a rough estimate being 2,000 acres. Last season there were several farmers who had patches of about 30 acres. This season it is expected that the 100-acre mark will be passed.

Departmental Activities.—The Department of Agriculture, through its instructors, are giving every assistance to the man on the land. Plots have been established in several localities for the purpose of demonstrating the best kinds of fodder crops to grow in order to provide herds with winter feed. Practical demonstrations have been given in stack-silage making, also in the raising of suitable crops for fodder conservation.

The farmers are practically co-operating with the Department in carrying out various tests, the results obtained being considered of very great value.

The accompanying illustrations show the fine results obtained from the present season's fodder crops grown on the farm of Mr. A. E. G. Barnard.

An asset to the district is the valuable stud shorthorn herd located at Calliungal, and owned by Mr. J. L. Wilson. Mr. Wilson evidently recognises the importance of the fact that judicious feeding must go hand in hand with successful breeding. Judging by the provision made in regard to fodder conservation, his motto appears to be "One paddock one silo," for on two of his properties—Calliungal and Calliope—he has erected nine silos. Dairymen please note.

DIRECTIONS FOR PLANTING UPLAND COTTON.

Cosmopolitan Character of Plant.—Under favourable climatic conditions, cotton will thrive on a great variety of soils.

A well-drained soil and a sheltered situation should be chosen.

Drought-resistant Habit.—The plant is a deep rooter, and naturally drought-resistant once it is firmly established, but responds to good cultivation and will return heavier crops where the surface soil is thoroughly prepared beforehand and moisture stored up in the subsoil and conserved by regular cultivation for the use of the growing crop.

Well-prepared Land Essential.—Land that is ploughed and cross-ploughed (not necessarily deep), say to a depth of 6 or 7 in., should be worked up to a good tilth on the surface prior to the seed being sown. In this way germination is assisted and a supply of plant-food made readily available.

A Good Crop for Scrub Land.—Cotton is a suitable crop for, and thrives well on, naturally burnt-off scrub land, the seed being sown in "hills" amongst the stumps and logs. Two or three seeds are sown to each "hill," spaced about 2 ft. apart.

Thinning should be carried out when the plants reach a height of from 6 to 8 in., the strongest plant being allowed to remain.

Weeds should be destroyed by hand cultivation and the surface soil surrounding the plants kept in a loose, friable condition.

Sowing Seed on Cultivated Land.—Five or six pounds are sufficient for an acre when care is exercised in planting.

Where a single-horse maize drill is used for planting the seed, very light furrows may be run out 4 ft. apart with the plough, and the seed drilled in the furrows, or a marker may be used, marking three rows at a time. Prompt harrowing immediately after these operations is necessary.

Rapid and economical planting is assured by the use of a two-row maize planter.

Distances between Plants in the Row.—A good average space between young growing plants is from 8 to 10 in. It is necessary, however, to thin these out when they are several inches high, leaving one strong plant at intervals of from 20 to 24 in.

Wide planting of upland cotton induces the formation of "vegetative" (woody) branches, to the detriment of the "flowering" (bud-bearing) branches, and a consequent reduction in its cropping capacity.

Treatment of Seed.—Owing to the short fluffy fibres adhering to the seed, it must be treated prior to attempting to pass it through a drill. Puddled clay or flour paste is commonly used for this purpose. Seed is dipped, in small quantities, into a vessel containing either of the above mixtures, the best consistency for which is readily ascertainable by a little practice. That treated with puddled clay should be rolled by hand on a sieve or other suitable surface, and the seeds made up to resemble small marbles, which must be allowed to dry out in the sun; when drying out, careful handling is necessary.

The flour-paste-treated seed is dipped into the prepared paste and drained and dried so that the seeds do not stick together.

Time to Plant.—Other things being favourable, the time for planting seed varies according to climatic conditions ruling in any particular district, and may be carried out as soon as danger from frost is over—up to October, and, in some localities, November.

Period of Maturity.—The crop takes from four to four and a-half months to mature. As the whole of the bolls do not ripen at once, it is necessary to go through the crop every few days and gather those which are thoroughly dry and have fully exposed their cotton.

Harvesting.—Picking should not commence until the dew has completely dried off the cotton.

The strictest care should be exercised to keep the seed cotton free from leaves, sticks, dirt, or foreign matter of any description, and stained or discoloured cotton should not be mixed with the clean, sound, marketable sample.

Clean bags or bales must be used for the reception of the crop. These should be legibly branded before despatch to their destination.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

By H. I. JENSEN, D.Sc. (Syd.).

(Continued from October Journal.)

We find prickly-pear in various places along the foreshores of Deception Bay, where seaspray is carried over the land, and back from the sea over areas which have been only recently salt marshes or arms of the sea. The pear does not spread back over the leached soils of the higher lands, because these soils contain no salts. With a view of testing this explanation, the writer collected three type soils—

- No. 460.—Typical brigalow soil with dense pear spreading fast, 40 miles north of Roma-Durham Downs road.
- No. 461.—Typical belah soil, with some pear, healthy but not spreading as fast as in the brigalow. Same road, 30 miles north of Roma.
- No. 462.—Typical box soil. Some pear, but not healthy. 35 miles north-west of Roma, on Cornwall Station.

Mr. E. H. Gurney, Chemist of the Queensland Department of Agriculture and Stock, kindly made an analysis of the water-soluble constituents of these three soils.

The result was most interesting and instructive, and show that valuable information may be gained by following this line of research.

——	No. 460.	No. 461.	No. 462.
	Per cent.	Per cent.	Per cent.
Soluble silica ..	·0068	·0036	·0068
Sodium chloride (common salt)	·0140	·0083	·0068
Sodium sulphate (white alkali)	·0085	·0122	Nil
Sodium carbonate (black alkali)	·0252	·0134	Nil
Magnesium chloride ..	Nil	Nil	·0012
Magnesium sulphate ..	Nil	Nil	Nil
Magnesium carbonate	·0012	·0017	·0004
Calcium chloride	Nil	Nil	Nil
Calcium sulphate (gypsum)	Nil	Nil	·0046
Calcium carbonate ..	·0264	·0286	·0054
	·0821	·0675	·0252
Total soluble ..	·1021	·1200	·0444
Organic matter, &c. ..	·0200	·1525	·0192

It may be stated that No. 460 was a calcareous shale soil—very heavy clay. No. 461 was a calcareous sandstone soil—a light friable chocolate loam. No. 462 was a somewhat stiff shale soil, from aluminous rather than calcareous shale.

It is interesting to note that the brigalow scrub was remarkably high in common salt and both white and black alkali, which is exactly what was expected.

The very alkaline and saline brigalow country is pure brigalow–prickly-pear scrub, with very little admixture of other vegetation. Where the country is less alkaline we get with the brigalow some belah (*Casuarina lepidophloia*), box (*Eucalyptus populifolia*), wilga (*Geijira parviflora*), sandalwood (*Eremophila Mitchelli*), whitewood (*Atalaya hemiglauca*), bottle-tree (*Sterculia rupestris*), currajong (*Sterculia diversifolia*), orange (*Canthium buxifolium* and *Canthium oleifolium*), pomegranate or orange (*Capparis Mitchelli*), mulpup (*Capparis lasciantha*), myall (*Acacia pendula*), red ash (*Alphistonia excelsa*), emu apple (*Owenia acidula*), buttercup bush (*Cassia eremophila*), and numerous other things less distinctive.

Brigalow-Belah Country.—This is country in which brigalow and belah occur together in almost equal proportions. The soil is heavy, but not as heavy as those previously discussed. It has a clay subsoil and overlies arenaceous shales rich in lime. It can be successfully cultivated and should suit some varieties of cereals, which, no doubt, the Agricultural Department can recommend.

The vegetation is much the same as that given for the less-alkaline brigalow soils. Wilga, myall, sandalwood, emu apple, and bottle trees occur in the scrubs.

Belah Country.—Where the belah forms scrubs by itself, the soil is usually a sandy loam with a porous subsoil overlying sandstone formation rich in lime; in fact, calcareous sandstone. Belts of this rock are frequent in the Walloon formations between Roma and Injune. These soils are of excellent mechanical texture, rich in plant-food and easy to clear, and rank easily with the river alluvials as the best agricultural soils in the area. As Mr. Gurney's water-soluble analyses show, the type belah soil is not excessively charged with alkali.

These soils should grow good fruit orchards, and should be fine wheat soils. They are also, when cleared, excellent grass lands.

Sandalwood Country (Sandalwood—*Eremophila Mitchelli*).—The soil is usually loamy and of a chocolate colour. It is fair to good in mineral plant-food, but it has a clay subsoil which makes it favourable for the cultivation of cereals, but not too good for fruit trees. The subsoil is very impervious; hence this class of country is good for dam and tank construction. It is well grassed.

Associated with sandalwood we usually get some box and silverleaf ironbark (*Eucalyptus melanophloia*), the latter where a stony formation gets close to the

surface. The other associated trees are myall (*Acacia pendula*), wilga (*Geijera parviflora*), whitewood (*Atalaya hemiglauca*), emu apple (*Owenia acidula*), and orange (*Capparis Mitchelli*). The soil is free from excessive salinity, but has a high absorptive power for water, and hence gets very boggy after rain.

Box (Eucalyptus populifolia, poplar box) Country.—The soil on which the poplar box holds sway is usually a grey clay soil, fair in mineral plant-food, but rather too heavy for cultivation and generally inclined to be sour. It holds water well, but has poor capillary powers, differing in that respect from the sandalwood country.

Associated with box we may get, on the one hand, a sprinkling of the belah scrub timbers or of the sandalwood country timbers, or, on the other hand, silver-leaved ironbark if the stone is near the surface.

Sometimes we get a fair amount of poplar box on felspathic sandstone country, where, however, it is subordinate to pine, Moreton Bay ash (*Eucalyptus tesselaris*), sugar-gum (*Angophora lanceolata*), and tumbledown gum (*Eucalyptus dealbata*). This class of country is poor in lime, but typical box country is fair in lime.

Sandalwood with box country is usual on shale and felspathic sandstones with fair lime content.

Silverleaf (Eucalyptus melanophloia) Country.—This ironbark south of the Dividing Range is usually characteristic of soils of fair quality but not deep. The rock is near the surface. It is country which has a good mechanical composition, but owing to the soil being shallow it is liable to dry out very quickly in dry weather. The grass is good in good seasons, but bad in bad seasons. We get the silverleaf mainly on felspathic and calcareous sandstone, while pine dominates on silicious sandstones. The commonest associate of silverleaf is poplar box.

Pine Country (Pine—Callitris glauca).—Pine is characteristic of the most silicious of sandy soils. It is poor country, very deficient in mineral plant-food though good in mechanical texture. Pine country is found on silicious sandstones. It will grow fair wheat crops in favourable seasons for a year or two, but soon gets exhausted and then needs heavy manuring. The grasses are poor or useless. Spinifex is often the main grass.

While pure pine scrubs occur on the driest of sandy areas, wherever moisture conditions are better or the soil is a little more clayey, we get associated with pine silverleaf ironbark, Moreton Bay ash, sugar gum, crooked gum (*E. dealbata*), apple (*Angophora intermedia*), yellow bloodwood (*Eucalyptus trachyphloia*), quinine (*Petalostigma quadriloculare*), dogwood (*Jacksonia scoparia*), cherry (*Exocarpus cupressiformis*), grevilleas, hakeas, wattles (most widespread of which is *Acacia Cunninghamii*), pear (*Xylometon pyriforme*), and rosemary (*Cassinia levis*). Amongst other plants collected on poor sandy country on the Walloon belt, between Roma and Injune, are *Hoovea longipes, Eucalyptus decorticans, Acacia doratoxylon, Acacia decora, Acacia decurrens, Acacia macradenia, Acacia podolyriæfolia, Casuarina inophloia, Lysicarpus termifolius, Dodonea viscosa, Cassia eremophila,* &c. This great retinue of shrubs occurs on the dry pine areas and on the stringybark areas in sandstone country where the soil is shallow and dry. Stringybark (*Eucalyptus acmenioides*) is found only on hills and tablelands in sandstone together with pine, woolly oak (*Casuarina inophloia*), *Acacia Bancrofti,* and budgeroo (*Lysicarpus ternaifolius*). In wet places or on very deep sandy soils with high capillary power we get *Moreton Bay Ash-Sugar Gum Country.*—This country is poor in plant-food but grows good crops for a few years, when fertilisers become essential. In this class of country we have open forest. The chief associate timber is tumbledown gum. Sugar gum and Moreton Bay ash are invariably on sandstone formation. Along creeks and near springs the apple (*Angophora intermedia*) and red gum (*Eucalyptus tereticornis*) accompany the abovementioned timbers.

The Basaltic Lands around Mount Hutton.—These yield rich chocolate loams and, in ill-drained places on tablelands, black soils. They grow excellent grass and herbage and, where the soil is chocolate and the country not too steep, should yield excellent agricultural land. The area of suitable land is, however, not great.

The timbers present on the basalt are chiefly box (*Eucalyptus hemiphloia*), coolibah (*E. microtheca*), and silverleaf ironbark (*E. melanophloia*).

Gilgai Country occurs in brigalow and brigalow-belah scrubs. It is rich in plant-food, but too alkaline and stiff, as well as too uneven, to be suited for cultivation. The origin of gilgais is supposed to be due to the high expansion and contraction of the soil on wetting and drying.

BOILED COTTON SEED AS STOCK FOOD.

By E. Graham, Chief Dairy Expert.

Owing to the increased attention that is now being given to the growing of cotton by farmers in this State, there is a correspondingly larger amount of cotton seed available each year, as feed for stock, and it is of more than passing importance that simple and inexpensive methods of preparing the cotton seed before use in feeding to stock should be understood generally.

A great deal of valuable information concerning the utilisation of cotton seed for stock-feeding purposes has been supplied by officers of this Department, and the same has been available to dairymen interested, through the medium of the Journal, from time to time. While it is widely recognised that cotton seed is comparatively high in nutriment, as a fodder, it has failed to grow into general use as a feed for dairy stock, partially on account of the difficulty attendant to the removal, by means of crushing or other device, of the hornlike substance of the shell which covers the kernel of the seed. However, as the result of experience which has been gained by the feeding of cotton seed, after boiling, to stock, the indications are that the crushing of the seeds and the removal of the shells are not really imperative.

For some time past it has been the practice of several dairymen to feed boiled cotton seed to the dairy cows, and the results to date go to show that the boiled cotton seed is quite satisfactory for use as a concentrate for feeding in conjunction with other fodders, such as white straw chaff, sorghum, cow-cane, &c.

The method of boiling the seed is as follows:—Place sufficient of the seed to meet the requirements of the herd for a day in a copper or other receptacle, and add enough water to cover the seed; then bring to a boil. The boiling should be continued for fifteen to twenty minutes, and by this time it will be found that the shells have been reduced to a sufficiently soft condition to allow of the kernels of the seed being pressed out of the shells with comparative ease. It is noticeable, also, that the shells, by boiling, lose a great deal of their original toughness, and it is highly possible, too, that the shells in this state are more readily digestible.

As the seeds have a tendency to float on water, it is advisable to cover the top of the receptacle in which the boiling is carried out; when this is done it is unnecessary to stir the seeds during boiling.

If boiled in an open vessel, it is best to press the seeds into the boiling water rather than to stir them, because harsh agitation of the seeds when the shells are softened causes the shells to break and the contents to be lost as feed.

After boiling is completed the superfluous water may be run off, and the seed is then ready for feeding purposes.

The boiled seeds do not ferment readily; consequently ample seed may be boiled at one time to fill the requirements for the day. It is estimated that 2 lb. of the boiled seed is approximately equivalent to 1 lb. of the dry seed.

Animals partaking of the cotton seed are healthy in appearance, and no difficulty is experienced in getting cows to take cotton seed in a boiled form.

OSTEOMALAGIA OR SOFT BONE.

When animals are suffering from this disease, which is very prevalent in some districts of Queensland (particularly on the North Coast Line), it is generally due to an insufficiency of lime in the soil.

The Chief Inspector of Stock (A. H. Cory, M.R.C.V.S.) recommends that the following lick be given in the manner described:—

Bone meal	1 lb.
Carbonate of iron	4 oz.
Gentian	4 oz.
Common salt	8 oz.
Foenugreek	4 oz.

One or two tablespoonfuls to be allowed each animal twice daily in food.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR SEPTEMBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ..	31 July, 1921	1,480	3·7	60·93	
Miss Security ...	" ...	20 Aug. "	1,502	3·6	60·08	
Iron Plate	Jersey ...	12 July "	1,015	4·9	58·45	
Affection of Gowrie Park	Ayrshire ...	8 Aug. "	1,223	3·9	53·31	
Bellona	" ...	26 June "	1,159	3·9	50·48	
College Mignon ...	Jersey ..	7 July "	809	5·1	48·47	
Prim	Holstein ...	9 Mar. "	1,178	3·5	45·41	
Hedges Madge ...	" ..	15 Aug. "	1,171	3·5	45·32	
Miss Betty ...	Jersey ...	7 July "	789	4·1	36·23	
College Cold Iron	" ...	10 Mar. "	685	4·3	32·95	
Gatton Glitter ...	Guernsey ...	9 Sept. "	630	4·7	32·60	
Yarraview Village Belle	" ...	6 Aug. "	543	5·1	32·53	
Hedges Nattie ..	Holstein ...	26 Feb. "	693	3·7	28·52	
Glow VI.	Guernsey ...	28 Aug. "	654	3·9	28·38	
College Cobalt ...	Jersey ...	6 Jan. "	510	4·8	27·59	
Netherton Belle ...	Ayrshire ...	30 Oct., 1920	570	4·3	27·48	
Magnet's Leda ...	Jersey ...	6 Oct. "	516	4·6	26·76	
Charming Damsel	Ayrshire ...	12 May, 1921	598	3·8	25·40	
Miss Fearless ...	" ..	26 May "	615	3·7	25·20	
Wattle Blossom ...	Guernsey ...	21 May "	428	5·0	25·14	
Rosine	Ayrshire ...	19 Jan. "	591	3·8	25·01	
Comedienne ...	Jersey ...	26 Nov., 1920	460	4·8	24·88	
Dawn of Warragaburra	" ...	15 Oct. "	461	4·7	24·38	
Royal Mistress ...	Ayrshire ...	19 Mar., 1921	571	3·7	23·46	
Lilia	" ...	3 April "	523	4·0	23·35	
Confidence... ...	" ...	8 Feb. "	508	4·1	23·25	
Hedges Dutchmaid	Holstein ...	26 May "	618	3·4	23·24	
Confidante ...	Ayrshire ...	12 May "	479	4.3	23·09	
College Ma Petite	Jersey ...	23 Dec., 1920	374	5·0	21·97	
Thornton Fairetta	" ..	15 Mar., 1921	360	5·1	21·57	
Snowflake	Shorthorn...	21 Dec., 1920	476	4·0	21·35	
College Grandeur	Jersey ...	29 Dec., "	420	4·5	21·24	

EXAMPLES OF RATIONS FOR PIG-FEEDING.

By E. H. GURNEY and V. S. RAWSON.

Standard ration as given by Kellner for pigs 100 lb. weight:—Dry matter, 3·6; digestible protein, ·45; digestible fat, ·09; starch equivalent, 3·20.

To compound a ration giving approximately these quantities of substances, it is necessary to first look up the analysis of the foodstuffs and to calculate on these figures.

For instance, a ration consisting of maize, skim milk, lucerne, and swedes:—

—	Parts per Hundred.			
	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
Maize	87	6·8	4·3	81·8
Skim milk	10	3·8	0·2	7·6
Green lucerne	19	2·7	0·4	8·7
Swedes	12	0·3	..	7·5

RATION No. I.—LB. OF SUBSTANCES.

3 lb. maize	2·61	·20	·13	2·45
5 lb. skim milk (½-gallon)	·50	·19	·01	·38
1 lb. green lucerne	·19	·03	..	·09
4 lb. swede turnips	·48	·01	..	·30
	3·78	·43	·14	3·22

RATION No. II.—FURTHER EXAMPLES.

3 lb. barley	2·58	·18	·06	2·16
5 lb. skim milk (½-gallon)	·50	·19	·01	·38
1 lb. sweet potatoes	·31	..	..	·24
3 lb. green lucerne	·57	·08	·01	·26
	3·96	·45	·08	3·04

RATION No. III.

3 lb. barley	2·58	·18	·06	2·16
5 lb. skim milk	·50	·19	·01	·38
3 lb. mangel	·36	..	..	·19
3 lb. lucerne	·57	·08	·01	·26
	4·01	·45	·08	2·99

RATION No. IV.

1¾ lb. barley	1·50	·11	·03	1·26
1½ lb. sorghum (seed)	1·27	·06	·04	1·02
5 lb. skim milk	·50	·19	·01	·38
3 lb. green lucerne	·57	·08	·01	·26
	3·84	·44	·09	2·92

RATION No. V.

2 lb. pollard	1·78	·20	·06	1·36
5 lb. skim milk	·50	·19	·01	·38
2 lb. green lucerne	·38	·06	·01	·18
5 lb. sweet potatoes	1·55	..	..	1·20
	4·21	·45	·08	3·12

RATION No. VI.

3 lb. barley	2·58	·18	·06	2·16
5 lb. buttermilk	·50	·19	·05	·46
3 lb. cowpeas	·60	·06	·01	·28
1 lb. English potatoes	·25	..	..	·19
	3·93	·43	·12	3·09

	PARTS PER HUNDRED.			
	Dry Matter	Digestible Protein.	Digestible Fat.	Starch Equivalent.
RATION No. VII.				
3 lb. barley	2·58	·18	·06	2·16
5 lb. buttermilk	·50	·19	·05	·46
3 lb. cowpeas	·60	·06	·01	·28
3 lb. mangels	·36	..	..	·19
	4·04	·43	·12	3·09
RATION No. VIII.				
1¾ lb. barley	1·50	·11	·06	1·26
1½ lb. sorghum (seed)	1·27	·06	·04	1·02
5 lb. buttermilk	·50	·19	·05	·46
3 lb. green lucerne	·57	·08	·01	·26
	3·84	·44	·16	3·00
RATION No. IX.				
2¼ lb. wheat	1·96	·20	·03	1·61
5 lb. skim milk	·50	·19	·01	·38
2 lb. green lucerne	·38	·06	·01	·18
4 lb. sweet potatoes	1·24	..	..	·96
	4·08	·45	·05	3·13
RATION No. X.				
3 lb. wheat	2·74	·27	·04	2·14
4 lb. skim milk	·40	·15	·01	·31
2 lb. rape	·28	·02	·02	·14
12 lb. pumpkin	·96	·04	·02	·48
	4·38	·48	·09	3·07
RATION No. XI.				
2¼ lb. maize	1·96	·16	·10	1·84
5 lb. skim milk	·50	·19	·01	·38
4 lb. green lucerne	·76	·11	·02	·35
1 lb. molasses	·76	..	..	·48
	3·98	·46	·13	3·05

EXAMPLES OF CALCULATING RATIONS.

Referring to Ration I. we see that 100 lb. of maize contain 87 lb. of dry matter, therefore 3 lb. contain $\frac{3}{100} \times \frac{87}{1}$ = lb. 2·61 lb.

Similarly 100 lb. of maize contain—

6·8 lb. of digestible protein,
4·3 lb. of digestible fat,
81·8 lb. of starch equivalent.

Hence 3 lb. of maize contain—

$\frac{6{\cdot}8 \times 3}{100}$ lb. of digestible protein = ·204 lb.

$\frac{4{\cdot}3 \times 3}{100}$ lb. of digestible fat = ·129 lb.

$\frac{81{\cdot}8 \times 3}{100}$ lb. of starch equivalent = 2·454 lb.

Having obtained these figures in a similar way for all the foodstuffs to be supplied, we are able to calculate therefrom, by addition, the sum total of our food substances.

Let it be presumed, then, one is considering the compounding of a ration containing the same fodders, but in different quantities, *e.g.*, 2 lb. of maize, 5 lb. of skim milk, 5 lb. of green lucerne, and 2 lb. of swede turnips. The calculation is made on a similar basis to that mentioned above.

—	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
2 lb. maize	1·74	·14	·09	1·64
5 lb. (½-gallon) skim milk	·50	·19	·01	·38
5 lb. green lucerne	·95	·14	·02	·44
2 lb. swede turnips	·24	·01	..	·15
	3·43	·48	·12	2·61

The foregoing ration is nearly correct in the dry matter, but there is too high an amount of digestible protein (thus causing a waste); also the amount of starch equivalent is much too low. This latter is to be remedied without increasing the amount of digestible protein, and at the same time only slightly increasing the amount of dry matter. It is proposed to do this by the addition of 1 lb. of maize.

1 lb. of maize contains—

·87 lb. of dry matter,
·068 lb. of digestible protein,
·043 lb. of fat, and
·82 lb of starch equivalent,

and thus adding ·87 lb. of dry matter, and as 4 lb. of green lucerne contain ·72 lb. of dry matter, it is suggested to deduct this amount of green lucerne, which contains, besides, ·11 lb. of digestible protein and ·35 lb. of starch equivalent.

—	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
3 lb. maize	2·61	·20	·13	2·45
5 lb. (½-gallon) skim milk	·50	·19	·01	·38
1 lb. green lucerne	·19	·03	..	·09
2 lb. swede turnips	·24	·01	..	·15
	3·54	·43	·14	3·07

This ration is nearly correct, though slightly low throughout, with the exception of digestible fat, which is of minor importance. This ration may be adjusted, if desired, by adding a small amount of any of the three fodders which are most convenient.

For instance—

—	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
(A)—				
Ration	3·54	·43	·14	3·07
2 lb. swedes	·24	·01	..	·15
	3·78	·44	·14	3·22
(B)—				
Ration	3·54	·43	·14	3·07
¼-lb. maize	·22	·02	·01	·20
	3·76	·45	·15	3·27
(C)—				
Ration	3·54	·43	·14	3·07
1 lb. green lucerne	·19	·03	..	·09
	3·73	·46	·14	3·16

For fattening purposes (A) might be slightly the best, as (B) is inclined to be wasteful, and (C) is slightly low in starch equivalent. There is, however, very little to choose between them on the score of actual nutrition.

KELLNER'S RATION FOR FEEDING OF PIGS.

TABLE SHOWING DAILY REQUIREMENTS IN FOOD (IN POUNDS) PER 1,000 lb. LIVE WEIGHT.

Age in Months.	Live Weight per Head.	Dry Matter in total Ration.	Digestible Substances		
			Protein.	Fat.	Starch equivalent.
	lb.	lb.	lb.	lb.	lb.
(*a*) Breeding Stock—					
2—3	44	44	6·2	1·0	33·8
3—5	88	36	4·0	0·8	27·3
5—6	120	32	3·0	0·5	23·2
6—9	175	28	2·3	0·3	20·2
9—12	265	25	1·7	0·2	15·8
(*b*) Fattening Stock—					
2—3	44	44	6·2	1·0	33·8
3—5	110	36	4·5	0·9	32·0
5—6	145	32	3·5	0·7	26·5
6—9	200	28	3·0	0·5	24·5
9—12	285	25	2·4	0·3	19·8

COMPOSITION OF FOODS.

Green Fodder.	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 lb.				Starch equivalent per 100 lb.	Lbs. of Food to give.	
		Protein.	Crude Fat.	Carbohydrates or Nitrog. Free Extract.	Crude Fibre.		0·45 lb. of Protein.	3·2 lb. of Starch equivalent
Grasses—								
Barley (young) ..	19	1·5	0·3	6·4	3·1	9·6	30	33
Buffalo grass ..	22	1·2	0·4	9·0	2·9	12·0	37	27
Couch grass ..	26	2·4	0·3	7·3	5·3	12·5	19	26
Maize	29	1·2	0·4	9·8	6·4	14·5	37	22
Indian Cane ..	23	0·7	0·2	7·9	6·0	12·0	64	27
Oats (in green head)	21	1·0	0·4	7·5	3·6	11·0	45	29
**Panicum muticum* ..	27	1·4	0·3	7·3	6·0	12·0	32	27
Paspalum dilatatum	25	1·3	0·4	7·2	6·4	13·0	35	25
Prairie grass ..	23	2·1	0·6	6·1	4·5	10·5	21	31
Rhodes grass ..	29	1·0	0·4	8·6	7·7	15·0	45	21
Rye	24	1·4	0·5	7·0	4·9	11·3	32	28
*Sorghum	29	1·2	0·5	11·3	5·4	15·0	37	21
Sugar-cane (stalk) ..	29	1·0	0·5	14·0	6·5	18·5	45	17
Sugar-cane tops ..	27	1·1	0·6	8·9	6·7	14·0	41	23
Legumes—								
Beans (various) ..	15	1·5	0·5	4·1	1·6	7·1	30	45
Cowpea	20	1·9	0·5	6·2	2·9	9·5	24	34
Lucerne (flower) ..	24	1·5	0·4	5·7	3·5	8·4	30	38
Lucerne (young) ..	19	2·7	0·4	4·7	2·0	8·7	17	37
Peas	15	1·9	0·3	3·2	2·3	6·6	24	49
Peas (field)	17	1·6	0·3	3·7	3·0	6·8	28	47
Vetches (in flower)	17	1·4	0·3	4·9	2·3	7·5	32	43

* The Fodders marked contain hydrocyanic acid and prussic acid yielding glucosides, and must therefore be used with caution.

COMPOSITION OF FOODS—*continued.*

Green Fodders.	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 lb.				Starch equivalent per 100 lb.	Lbs. of Food to give.	
		Protein.	Crude Fat.	Carbohydrates or Nitrog. Free Extract.	Crude Fibre.		0·45 lb. of Protein.	3·2 lb. of Starch equivalent.
Various—								
Cabbage	15	1·2	0·4	6·5	1·7	9·4	37	34
Mustard	15	1·3	0·2	4·9	1·5	7·2	35	43
Rape	14	1·3	0·5	3·9	1·9	7·0	35	46
*Sweet potato vines..	14	1·3	0·5	4·3	1·7	7·0	35	46
Roots, Tubers, &c.—								
Artichokes, Jerusalem	20	0·4	..	15·8	0·2	16·4	112	20
Beets (sugar) ..	25	0·3	..	20·3	0·5	15·8	150	20
Carrots	13	0·4	0·1	8·9	0·7	8·7	112	37
*Cassava	32	0·3	..	26·4	0·6	26·3	150	12
Mangels	12	0·1	..	8·3	0·3	6·3	450	51
Melon (pie)	6	0·1	..	3·9	0·1	4·0	450	80
Potatoes	25	0·1	..	18·9	..	19·0	450	17
Potatoes (sweet) ..	31	0·1	..	24·0	..	24·0	450	13
Swedes	12	0·3	..	7·6	0·9	7·5	150	43
Turnips	8	0·2	..	5·5	0·3	4·6	225	70
Pumpkin	8	0·3	0·2	4·5	0·2	4·0	150	80
†*Grains, Seeds, &c.*—								
Barley	86	6·1	1·9	62·4	1·3	72·0	7·4	4·4
Beans	86	19·3	1·2	44·1	4·1	66·6	2·3	4·8
Buckwheat	86	7·5	1·9	42·3	3·5	52·7	6·0	6·1
Corn (maize) ..	87	6·8	4·3	65·5	0·8	81·8	6·6	3·9
Millet	88	7·4	3·1	45·8	2·7	59·7	6·1	5·4
*Linseed	93	18·1	34·7	18·3	1·8	119·2	2·5	2·7
Oats	87	7·2	4·0	44·8	2·6	59·7	6·2	5·4
Peanut	93	24·6	46·7	10·2	2·4	146·5	1·8	2·2
Rice	87	5·5	0·2	75·8	0·7	82·0	8·2	3·9
Rye	87	8·7	1·1	63·9	1·0	71·3	5·2	4·5
Soja beans	90	26·2	15·8	20·8	1·7	83·9	1·7	3·8
Sorghum	85	4·1	2·5	57·8	1·7	67·9	11·0	4·7
Sunflower	93	11·1	30·7	10·3	9·4	96·0	4·0	3·3
Wheat	87	9·0	1·2	63·5	0·9	71·3	5·0	4·5
Various—								
Bran	89	10·0	2·7	44·3	3·6	48·5	4·5	6·6
Blood meal	91	68·0	2·0	..	..	67·7	0·7	4·7
Butter milk ..	10	3·8	1·1	4·0	..	9·2	11·8	35·0
Fish meal	90	40·1	11·0	..	..	64·2	1·1	5·0
Meat meal	90	63·6	12·5	..	..	89·9	0·7	3·6
Milk (whole) ..	12	3·3	3·4	4·6	..	14·7	13·6	21·8
Milk (separated) ..	10	3·8	0·2	4·7	..	7·6	11·8	42·0
Molasses	76	..	..	54·9	..	48·0	..	6·7
Pollard	89	10·0	3·2	49·8	2·2	68·2	4·5	4·7
Whey	7	0·9	0·8	4·9	..	6·4	50·0	50·0

* Contains hydrocyanic acid and prussic acid yielding glucosides, and must therefore be used with caution.

† Hard grains and seeds need soaking in water, until soft, before feeding to pigs.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, SEPTEMBER, 1921.

The seasonal increase in egg production for the month resulted in nearly every pen adding considerably to its tally. A noticeable feature for the month, and, in fact, during the whole of the test, is the freedom from broodiness. Several very good scores can be reported, viz., H. C. Towers's "F" bird produced the possible, 30 eggs; the following laid 29 eggs each:—W. Becker's "A," H. Fraser's "A," T. Fanning's "C", and E. Morris's "A." R. Burns had four of his six hens producing 28 eggs each, and T. Hindley two with the same number to their credit. The following deaths are reported:—T. Eyre's "C" hen and two birds in T. Hart's group pen of Black Orpingtons. J. W. Newton's "A" hen and Haden Poultry Farm's "A" are at present isolated. The following are the individual records and weights of eggs:—

Competitors.	Breed.	Sept.	Total.
	LIGHT BREEDS.		
R. Gill	White Leghorns	137	765
*J. M. Manson	Do.	149	750
*W. and G. W. Hindes	Do.	146	748
H. C. Thomas	Do.	120	716
F. Birchall	Do.	127	715
*Geo. Trapp	Do.	142	714
Oakleigh Poultry Farm	Do.	133	707
*Mrs. R. Hodge	Do.	139	701
*H. C. Towers	Do.	143	685
*H. Fraser	Do.	140	682
*C. M. Pickering	Do.	127	674
R. C. Cole	Do.	130	671
W. A. Wilson	Do.	132	654
*J. W. Newton	Do.	123	647
*W. Becker	Do.	137	645
*T. Fanning	Do.	143	641
*C. Goos	Do.	128	621
Mrs. E. White	Do.	128	618
H. Stacey	Do.	131	618
Bathurst Poultry Farm	Do.	124	611
*E. Chester	Do.	124	609
M. F. Newberry	Do.	128	603
*R. C. J. Turner	Do.	121	601
W. Barron	Do.	129	598
*Thos. Taylor	Do.	126	593

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Sept.	Total.
	LIGHT BREEDS—*continued.*		
*Thos. Eyre	White Leghorns	132	587
J. W. Short	Do.	130	586
*S. L. Grenier	Do.	132	585
Mrs. E. Z. Cutcliffe	Do.	118	582
*B. Chester	Do.	134	581
*G. Williams	Do.	131	580
O. C. Goos	Do.	110	580
E. Stephenson	Do.	113	574
*Mrs. L. Anderson	Do.	127	570
*E. A. Smith	Do.	135	565
Linquenda Poultry Farm	Do.	128	555
*Haden Poultry Farm	Do.	118	552
*W. and G. W. Hindes	Brown Leghorns	118	550
*H. P. Clarke	White Leghorns	129	516
W. M. Glover	Do.	112	508
rampton Poultry Farm	Do.	116	474
	HEAVY BREEDS.		
T. Fanning	Black Orpingtons	145	812
*J. Ferguson	Chinese Langshans	132	744
Rev. A. McAllister	Black Orpingtons	141	740
Jas. Potter	Do.	104	738
*T. Hindley	Do.	148	736
*R. Burns	Do.	161	729
*A. E. Walters	Do.	140	715
W. Becker	Langshans	139	708
*Parisian Poultry Farm	Black Orpingtons	149	702
Jas. Every	Langshans	124	699
G. Muir	Black Orpingtons	134	697
Jas. Ryan	Rhode Island Reds	117	689
*C. C. Dennis	Black Orpingtons	134	684
*E. F. Dennis	Do.	129	653
*J. Cornwell	Do.	134	644
*E. Morris	Do.	133	638
*E. Stephenson	Do.	125	622
*R. Holmes	Do.	131	614
G. Cumming	Do.	112	579
*N. A. Singer	Do.	141	572
*H. C. Chaille	Do.	125	569
J. W. Newton	Do.	117	552
*A. Shanks	Do.	137	550
*J. E. Smith	Do.	118	549
*Mrs. G. Kettle	Do.	108	544
*E. Oakes	Do.	130	497
F. Harrington	Rhode Island Reds	129	475
T. C. Hart	Do.	110	395
Total	...	8,940	43,378

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
			LIGHT BREEDS.				
J. M. Manson	115	130	135	117	139	114	750
W. and G. W. Hindes (W.L.)	135	114	124	138	135	102	748
Geo. Trapp	120	111	119	117	129	118	714
Mrs. R. Hodge	113	127	129	120	126	86	701
H. C. Towers	119	101	117	95	113	140	685
H. Fraser	130	98	119	108	118	109	682
C. M. Pickering	123	117	108	97	130	99	674
J. W. Newton	113	127	126	104	85	92	647
W. Becker	127	123	95	98	135	67	645
T. Fanning	121	101	112	99	99	109	641
C. Goos	107	125	76	77	90	146	621
E. Chester	108	111	101	97	95	97	609
R. C. J. Turner	104	95	95	87	108	112	601
Thos. Taylor	96	112	97	76	86	126	593
Thos. Eyre	98	101	62	109	113	104	587
S. L. Grenier	102	122	72	101	97	91	585
B. Chester	93	93	116	88	111	80	581
G. Williams	138	106	73	83	89	91	580
Mrs. L. Anderson	94	109	97	86	105	79	570
E. A. Smith	126	96	97	92	88	66	565
Haden Poultry Farm	70	82	98	99	95	108	552
W. and G. W. Hindes (B.L.)	77	83	77	104	89	120	550
H. P. Clarke	124	75	87	60	87	83	516
			HEAVY BREEDS.				
J. Ferguson	121	118	111	138	127	129	744
T. Hindley	133	123	127	99	133	121	736
R. Burns	70	112	153	103	143	148	729
A. E. Walters	130	125	111	114	113	122	715
Parisian Poultry Farm	110	118	118	150	83	123	702
C. C. Dennis	121	107	96	125	116	119	684
E. F. Dennis	90	117	107	107	107	125	653
J. Cornwell	105	87	113	126	104	109	644
E. Morris	115	114	69	125	105	110	638
E. Stephenson	116	101	103	100	87	115	622
R. Holmes	86	98	102	115	132	81	614
N. A. Singer	95	82	93	96	87	119	572
H. C. Chaille	67	106	97	124	106	69	569
A. Shanks	64	94	85	100	101	106	550
J. E. Smith	122	127	97	76	66	61	549
Mrs. G. Kettle	93	106	118	53	77	98	544
E. Oakes	54	104	85	111	77	66	497

WEIGHT OF EGGS, SINGLE HEN PENS.

—	A.	B.	C.	D.	E.	F.	Average.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
			LIGHT BREEDS.				
S. L. Grenier	2	2	$2\frac{1}{8}$	2	$1\frac{7}{8}$	2	2
W. and G. W. Hindes (W. L.)	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$
Mrs. L. Anderson	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$
G. Williams	$2\frac{1}{4}$	2	$2\frac{1}{8}$	2	$1\frac{1}{4}$	2	$2\frac{1}{8}$
Mrs. R. Hodge	2	$2\frac{1}{8}$	2	2	2	2	2
J. M. Manson	$2\frac{1}{8}$	$1\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$
W. Becker	$1\frac{7}{8}$	$2\frac{1}{8}$	2	$2\frac{1}{8}$	2	2	2
C. Goos	2	2	$1\frac{3}{4}$	$2\frac{1}{4}$	2	2	2
J. D. Newton	2	$2\frac{1}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	2

WEIGHT OF EGGS, SINGLE HEN PENS—*continued.*

—	A.	B.	C.	D.	E.	F.	Average.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS—*continued*							
T. Taylor	$2\frac{1}{8}$	2	$2\frac{1}{8}$	$2\frac{3}{8}$	2	$1\frac{3}{4}$	$2\frac{1}{8}$
Haden Poultry Farm	2	2	2	2	$2\frac{1}{8}$	2	2
H. P. Clarke	2	$2\frac{1}{8}$	2	$2\frac{1}{8}$	2	2	2
T. Eyre	2	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$
H. Fraser	$1\frac{7}{8}$	2	$1\frac{7}{8}$	2	$1\frac{7}{8}$	2	$1\frac{7}{8}$
Geo. Trapp	2	2	2	2	2	2	2
T. Fanning	2	2	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	2	$2\frac{1}{8}$
R. C. J. Turner	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{8}$	$2\frac{1}{8}$	2	2	$2\frac{1}{8}$
W. and G. W. Hindes (B. L.) ..	2	$1\frac{7}{8}$	$1\frac{7}{8}$	2	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$
E. Chester	2	2	$1\frac{7}{8}$	$1\frac{7}{8}$	$2\frac{1}{8}$	2	2
H. C. Towers	$1\frac{7}{8}$	2	$1\frac{7}{8}$	2	2	2	2
B. Chester	$1\frac{7}{8}$	$1\frac{7}{8}$	2	2	$2\frac{1}{8}$	$2\frac{1}{8}$	2
E. A. Smith	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{8}$
C. M. Pickering	$2\frac{1}{4}$	2	$1\frac{7}{8}$	$2\frac{1}{4}$	2	$2\frac{1}{4}$	$2\frac{1}{8}$
HEAVY BREEDS.							
T. Hindley	$1\frac{5}{8}$	$1\frac{7}{8}$	2	$1\frac{7}{8}$	$1\frac{7}{8}$	2	$1\frac{7}{8}$
R. Burns	$2\frac{3}{8}$	$1\frac{7}{8}$	$2\frac{3}{8}$	$2\frac{1}{4}$	$2\frac{1}{8}$	$1\frac{7}{8}$	$2\frac{1}{8}$
E. F. Dennis	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	2	2
A. E. Walters	$1\frac{7}{8}$	$2\frac{1}{8}$	2	$2\frac{1}{8}$	$1\frac{7}{8}$	2	2
Mrs. H. H. Kettle	$2\frac{1}{8}$	$2\frac{1}{8}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	2	2
Parisian P. Farm	2	2	$1\frac{7}{8}$	$1\frac{3}{4}$	2	2	$1\frac{7}{8}$
J. E. Ferguson	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$1\frac{7}{8}$	2	2	2
R. Holmes	$1\frac{3}{4}$	$2\frac{1}{8}$	2	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$1\frac{7}{8}$
A. Shanks	$2\frac{1}{4}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{8}$
J. E. Smith	$1\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$1\frac{7}{8}$
E. Stephenson	2	$2\frac{1}{8}$	$1\frac{7}{8}$	$2\frac{1}{8}$	$1\frac{7}{8}$	2	2
N. A. Singer	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	2	2	$2\frac{1}{8}$	$2\frac{1}{8}$
E. Morris	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$1\frac{7}{8}$	2	$1\frac{7}{8}$	2
H. Chaille	2	2	2	$2\frac{1}{8}$	$1\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{8}$
E. Oakes	2	$1\frac{7}{8}$	2	$1\frac{7}{8}$	$2\frac{1}{4}$	$2\frac{1}{8}$	2
C. C. Dennis	2	$1\frac{7}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$	$1\frac{7}{8}$
J. A. Cornwell	$2\frac{1}{8}$	2	2	$1\frac{7}{8}$	2	$1\frac{7}{8}$	2

GROUP PENS.

—	Average.	—	Average.
LIGHT BREEDS.			
	Oz.		Oz.
W. M. Glover	$2\frac{1}{4}$	H. C. Thomas	$1\frac{7}{8}$
H. Stacey	$1\frac{7}{8}$	Mrs. E. Cutcliffe	2
O. Goos	$2\frac{1}{8}$	J. Short	$2\frac{1}{8}$
R. Gill	$1\frac{7}{8}$	Linquenda P. Farm ..	$1\frac{7}{8}$
Oakleigh P. Farm	$1\frac{7}{8}$	F. Burchall	2
E. Stephenson	2	Brampton P. Farm ..	$2\frac{1}{3}$
R. Cole	2	Bathurst P. Farm	$1\frac{7}{8}$
Mrs. E. White	2	M. F. Newberry	2
W. A. Wilson	2	W. Barron	$1\frac{7}{8}$
HEAVY BREEDS.			
W. Becker	$1\frac{7}{8}$	G. Cummings	2
J. Ryan	$1\frac{7}{8}$	G. Muir	$1\frac{7}{8}$
T. Hart	2	T. Fanning	$2\frac{1}{8}$
Rev. A. McAllister	2	J. Newton	2
F. Harrington	2	J. Every	$1\frac{7}{8}$
J. Potter	$1\frac{3}{4}$		

CUTHBERT POTTS,
Principal.

The Orchard.

THE FRUITGROWING INDUSTRY.

BY ALBERT H. BENSON, M.R.A.C.

I.

(*The first of a series of articles relating to marketing methods and problems, containing suggestions for the consideration of all engaged in fruit production.*)

Fruitgrowers, not only in Queensland, but in the whole of the Commonwealth, are beginning to realise the unsatisfactory condition into which the selling end of their industry has been allowed to drift, and to recognise that the only way to place it upon an improved basis is to radically and drastically alter the methods employed for the disposal, distribution, and utilisation of their products.

The difficulty confronting growers to-day is not how to grow fruit, but how and where to sell it. This difficulty is not a new one. It is one that has, year after year, been discussed at local, interstate, and Australian fruit conferences since the first interstate assembly at Mildura in May, 1894. At the Australian conference at Sydney in August last a discussion on marketing problems was a leading item on the business-sheet. Many suggested solutions have been brought forward for discussion from time to time, and these have been wide enough to cover—

(1.) Co-operation among growers to open up oversea markets;

(2.) Obtaining facilities for transport thereto;

(3.) Improved means of interstate transport;

(4.) Institution of more efficient marketing organisation;

(5.) Popularising the use of fruit; and

(6) The employment of every other means of creating a stronger demand within the Commonwealth.

These ideas are all sound and practical, as are also other proposals in respect to the conservation and utilisation of surplus supplies.

Unfortunately, however, although growers have repeatedly affirmed the desirability of initiating reforms whenever they met to discuss the position and condition of their industry, they have, apparently, remained content with merely carrying resolutions, instead of translating good will to strong action. The matters involved have thus been carried forward from conference to conference, and so repeated decisions have, consequently, through failure to sustain the energy of the initial effort, remained inoperative or ineffective. In this way conferences fail to accomplish much of their real purpose. Unless resolutions are made effective and co-operative effort becomes more than merely a platitudinous term and more of an actual fact, the industry cannot attain the degree of importance in the commercial world that it obviously merits. It is difficult to account for this inertia, but it is probably due to the fact that so very little real co-operation exists among fruitgrowers, who, like their confréres in other branches of agriculture, are often very conservative and suspicious of any innovation. This spirit seems to continue to exist in spite of the knowledge that the value of co-ordinated and co-operative effort has been incontestably proved as really the only means by which primary producers can place their industry on a sound business basis.

At the present time the most serious difficulty facing fruit producers is their inability to place their products, in one form or another, at a price that will provide a fair thing for both producer and consumer. This failure in properly organised distribution is a very serious bar to the extension of the industry. It also affects the general health of the community, for fruit is held to be a dietary essential. This, in a country like Australia, which is capable of producing practically every variety of cultivated fruit, should not be. Even in our furthest back country, fruit should, under a proper system of distribution, be readily obtainable at reasonable rates.

The question of distribution is, therefore, of vital importance to every grower and consumer, and the time for altering and improving present marketing methods is *now*. Unless obvious business difficulties can be quickly overcome, I feel certain that the fruit industry will meet with a serious check, and many growers will be hard hit. I have no wish to be pessimistic, nor do I think there is any immediate

necessity to be so, for on every side are signs of a general awakening. Still, I think it right to sound a timely note of warning, as, in my opinion, we cannot afford to waste any more time, but must make a determined effort immediately to grapple with the problems awaiting solution. Under existing conditions we are quite unable to cope with fruit-marketing difficulties at certain periods. We have had gluts, and we shall have them again, and the lessons they teach are obvious. At the time of writing, strawberries and bananas are returning little, if any, profit to the grower, and locally-grown lemons and Seville oranges are practically unsaleable. Over-supply of limited markets is plainly disastrous. These facts are known to all who take an intelligent interest in affairs, and they are enough to show the immediate necessity of vigorous business action.

The increased orchard acreage in all States adds to our difficulties and increases the urgency of organisation to meet them. Increased production will, naturally, intensify the market congestion that occurs at periods corresponding with the ripening of certain fruits, the nature of which compels their immediate disposal. This big increase in the area under fruit in all the States is mainly due to two factors—the policy of water conservation and the consequent utilisation of irrigable areas, and to the settlement of large numbers of returned soldiers. No provision has yet been made for the increased production that naturally follows extended settlement. Hence the necessity for market organisation and the improvement of every facility for satisfactory selling becomes every day more urgent. The question, therefore, naturally arises—what can be done to save the situation?

Before this question can be answered, it is necessary to determine what markets are accessible for both fresh and preserved products. In Queensland we want outlets for bananas, pineapples, papaws, mangoes, custard apples, strawberries, citrus fruits, and other products of the coastal districts, and also for the deciduous fruits of the granite belt.

In tropical products we have an advantage over the other States excepting a small region on the north-east coast of New South Wales. Consequently, there is practically no opposition, and that competition is confined almost entirely to bananas. Citrus fruits are, however, grown in all the other States, Tasmania excepted, and our only advantage rests in the fact that our citrus products ripen earlier; further, our mandarins are so superior in quality to the southern-grown that we can well hold our own on southern markets.

Though we have virtually a monopoly in the supply of tropical fruits, our system of advertisement and methods of distribution are so faulty that many Queensland fruits are quite unknown in other States. Lack of organisation, and, therefore, publicity on the part of our growers, is largely responsible for this state of affairs. Until recently no attempt had been made to reach markets other than those of the State capitals, and so familiarise southern consumers outside the main centres with Queensland fruits. Organisation, stabilisation, and judicious advertisement are essentials of successful marketing, and each can be covered by sound co-operative effort. Bananas, pines, and citrus fruits can be supplied to every railway station in the Commonwealth, provided packing, transport, and distribution are properly arranged. The more perishable products can be sent to many markets where they are at present unknown, under the same conditions.

These ideas are not theoretical, and all, judging by the great success of co-operative marketing systems operating in other countries, are well within practical range. Producers' organisations in the United States are at present distributing tropical as well as temperate fruits all over the Union. Incidentally, the results of forty years of American enterprise and experience are at our disposal when seeking a satisfactory solution of our own problems. What can be done there can be done here. The inauguration of the southern fruit trains by the Southern Queensland Fruitgrowers' Association is only a beginning of what may be accomplished, and is in itself evidence of the value of united and well-organised effort. When this trade is extended and distribution widened beyond the capital cities, its present limit, I feel certain that, in respect to our tropical and sub-tropical fruits, we shall have a market within the Commonwealth for the whole of our production.

For example, take bananas. At present the bulk of our exports are being railed to only the capital cities, where they are handled by wholesale distributors, who have, so far, made little, if any, attempt to supply many smaller markets, with the result that there are many centres all over Australia in which Queensland fruits are unknown, or unobtainable. If a demand is created, it is only supplied at exorbitant prices that make fruit, that should be looked upon as a necessity, a luxury for which the market is extremely restricted. It is not necessary even to go outside our own State to observe accessible yet unexploited markets. Go into the western country and note the price at which bananas are retailed—there is no need to leave the railway—and then say we have an unplaceable surplus! Get the fruit on to the

consumer's table at a reasonable price and increased consumption will surely follow. As an article of diet, fruit is a healthy essential, more particularly to inland dwellers.

The first, though somewhat halting, step has been taken to develop our southern fruit trade; the next step is to make the most of our home opportunities. Further development will inevitably follow. What is being advocated is no new thing. The building-up of the banana trade between the West Indies and the United Kingdom is an object lesson in scientific distribution, and the history of the business firm that inaugurated that enterprise reads like a romance. Our present haphazard methods of distribution are against increased local consumption, and they call for a careful study of solutions applied to similar problems in other fruit-producing countries.

At present we have only two available means of transport—sea and rail. The former necessitates shipment and transhipment, without proper facilities and suitable provision for the conveyance of perishable produce. This leaves our railways as the better means of transport, and they should, in my opinion, be used as a distributing agency to a far greater extent than at present. All the populous centres in the Commonwealth are served by rail, and are, therefore, open to ready exploitation. Our railways are already used as a distributing medium of goods by parcel post, and bulky packages are sent by city firms on the cash-on-delivery system. There seems no apparent reason, then, why the same facilities should not be extended to producers of fruit. A system of distribution could thus be organised in connection with existing agencies, and duplication avoided. The details of such a scheme would require much thought, and no doubt a practical arrangement with the railway authorities could be evolved.

I give the following suggestions for what they are worth and as possible material for a sketch of a scheme for connecting the interests of the producer and the consumer in present undeveloped markets:—

Every railway station to be made a distributing centre;

Where the trade warrants it, a receiver or distributor to be appointed on a commission basis, preferably a returned soldier incapacitated for heavy work;

The duties to include canvassing for orders, from retailers as well as the general public, in case lots of one or more. Prompt despatch of orders to the secretary of the Fruitgrowers' Association in the district of supply.

Goods to reach local distributor on a fixed date for immediate distribution.

The local distributor to remit, by draft, proceeds of sales. Growers to be protected by a fidelity guarantee bond.

In centres where the trade does not warrant the appointment of a local distributor, arrangements to be entered into with the Railway Department for the distribution of case lots on the cash-on-delivery system at present in vogue in connection with the country parcel trade of city firms.

THE EFFECT OF MANURING ON THE CARRYING AND KEEPING QUALITIES OF BANANAS.

BY ALBERT H. BENSON, M.R.A.C.

This is a question that crops up periodically, and regarding which there is a very great difference of opinion. Some banana-growers claim that the application of artificial fertilisers has a decidedly deleterious effect, and state that the fruit that is produced on the plants to which such fertilisers have been applied keeps and carries badly. On the other hand, other growers state that their experience has been just the reverse, and that the fruit produced by the plants that have been most heavily manured has been forwarded by them successfully to the most distant markets. As this matter has recently been again brought under the notice of the Department of Agriculture, inquiries have been made of growers who have for years been manuring their plantations heavily with complete artificial fertilisers, and the information supplied shows that they have never had any complaints regarding the keeping or carrying qualities of their fruit; further, that they have received top prices for their produce, for which there is a regular demand from buyers for distant markets. This is the experience of growers who have been using complete fertilisers in accordance with the advice given by this Department, and if other growers who claim that fertilisers injure their fruit will follow the same advice, it is probable that they will change their opinion.

The use of a badly balanced artificial fertiliser containing a great excess of either acid phosphates or readily available nitrogen, in large quantities on land that is deficient in organic matter or humus, might produce the adverse effect claimed, but a well-balanced fertiliser, even though applied in much larger quantities, will have no injurious effect whatever, but, on the contrary, prove a very profitable investment. Good bananas cannot be grown unless the soil possesses a good supply of humus as well as of all essential plant-food in an available form.

A FINE NAVEL ORANGE.

A representative sample of a small crop of fine navel oranges from a tree nine years old grown by Mr. F. A. Allen, at Nalembah, near Aramac, in the Central West, in open downs country, well cultivated without manure, and supplied with artesian water. Fruit perfect, with skin clean and well coloured. Weight, 2 lb. 2 oz.

Plate 68.—A Fine Navel Orange.

Horticulture.

FLOWERING TREES OF THE BRISBANE BOTANIC GARDENS.

BUTEA FRONDOSA.

NATURAL ORDER LEGUMINOSÆ.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—*Butea,* named in honour of the Earl of Bute; *frondosa,* from leafy, umbrageous.

Description (from Roxburgh's "Plants of Coromandel," 1795).—An erect tree reaching a height of from 40 to 50 ft. Trunk irregular, generally a little crooked, covered with ash-coloured, spongy, thick, slightly scabrous bark, the middle layer of which contains a red juice. From natural fissures and wounds made in the bark during the hot weather there exudes a beautiful juice that soon hardens into a ruby-coloured, brittle, astringent gum; but it soon loses its beautiful colour if exposed to the air. To preserve the colour the gum must be gathered as soon as it becomes hard, and kept closely corked in a bottle; pure water dissolves it, and the solution is of a deep red colour, used in dyeing.

Branches very irregular, bent in various directions, young shoots downy, leaves alternate, in threes, from 8 to 16 in. long, leaflets emarginated, or rounded at the apex, leathery; above shining and fairly smooth, below slightly hoary; entire, from 5 to 7 in. long, and from 3 to 4½ in. broad. Common petiole round, swollen at base, when young downy, racemes terminal, axillary, and from tuberosities over the naked wooded branches, rigid, and covered with a soft dark-greenish purple-coloured down.

Flowers.—Papilionaceous, pendulous, numerous, pedicelled, large, their ground colour a beautiful deep red shaded with orange and silver-coloured down that gives them a most beautiful "Indian red" appearance. Calyx campanulate, leathery, two-lipped, upper lip large, under lip three-toothed, covered with the same dark greenish-purple down as racemes. Petals bright orange red, thickly clothed on outside with silvery tomentum, reflected, pointed, upper one slightly over 1 in. in width, keel semi-circular, beaked, filaments one and nine in a regular semicircle, anthers equal, linear, erect, style ascending, a little longer than filaments, stigma small; individual flowers are about 2½ in. in length.

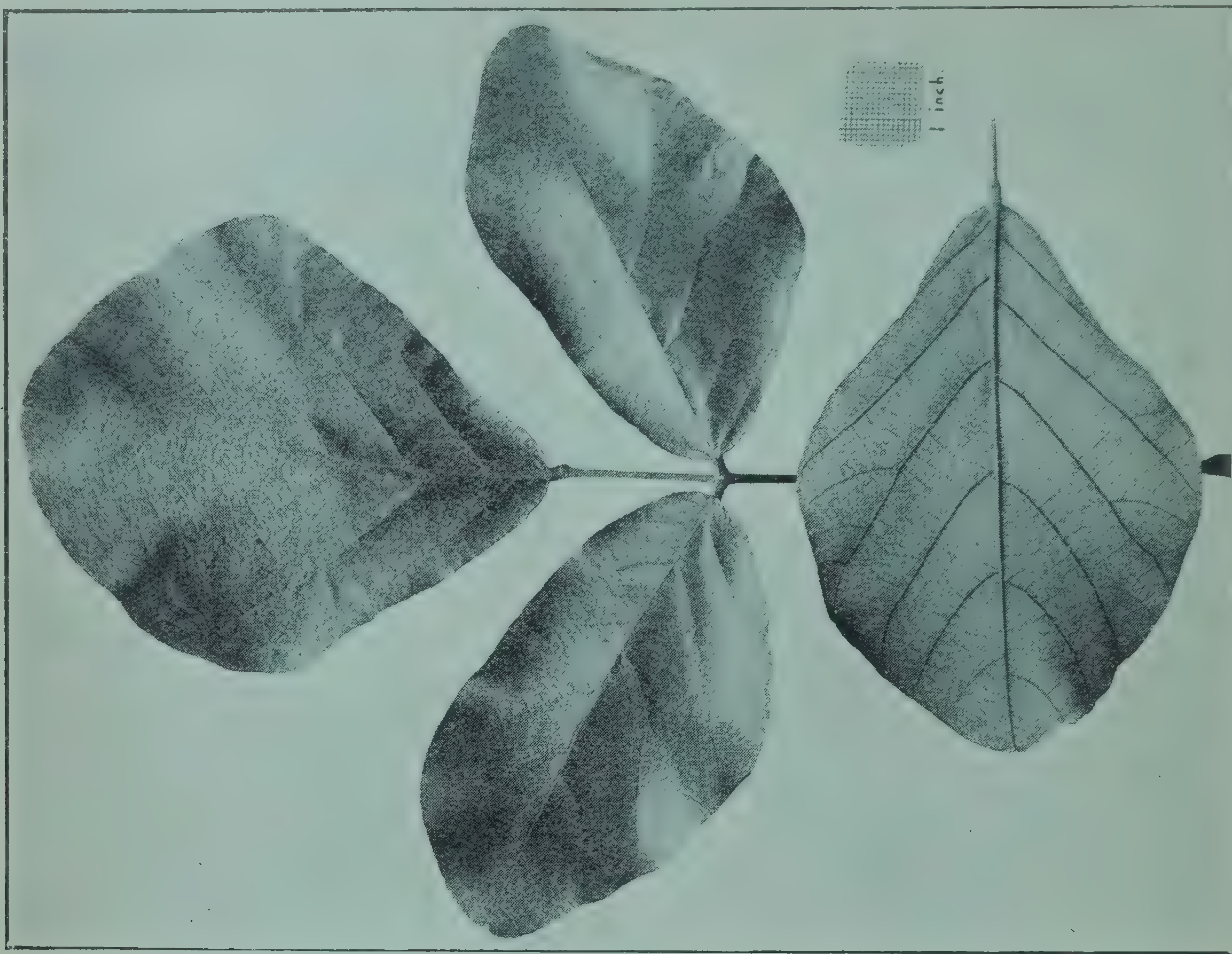
In addition to the gum already mentioned, the flowers, either fresh or dry, are used in India for dyeing purposes; they are prepared by infusion, and dye cotton cloth a most beautiful bright yellow, more or less deep according to strength of infusion. A little alkali added changes the colour to a deep reddish orange, but the least acid changes it to a yellow or lemon.

Pod.—Large, pendulous, all but the apex where the seed is lodged, downy, about 6 in. long by 2 in. broad, never opens by itself; seed one, lodged at point of pod, oval, much compresseed, smooth brown, about 1 to 1½ in. long and 1 broad.

Habitat.—Plains from the Himalayas to Ceylon and Burmah, ascending to 4,000 ft. in the north-west.

This beautiful flowering tree that forms such a bright-coloured feature of the Indian landscape during March and April flowers in Brisbane in November, and the fine specimen on corner of lawn below the bandstand in the Botanic Gardens attracts the attention of visitors by its vivid mass of colour when in flower, it being very conspicuous owing to the fact that the foliage falls off just previous to flowering.

Propagation.—Unfortunately, owing probably to being rather far south for this magnificent tree to be properly at home, although it flowers well each season, very few pods are produced, and only occasionally are seeds obtained.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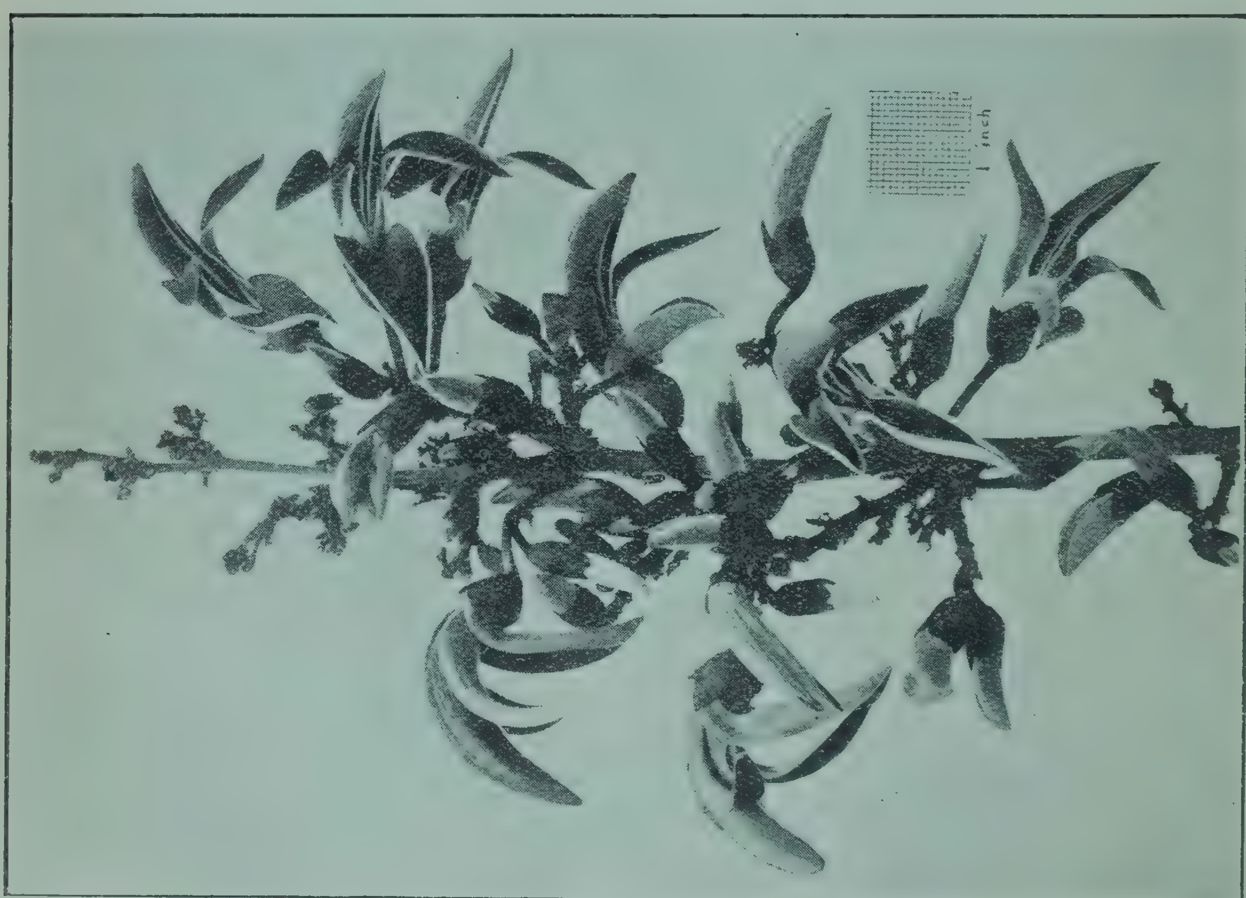
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Viticulture.

DOWNY MILDEW.

In accordance with a request made by vignerons of districts that suffered by the incursion of downy mildew last year, a Regulation under "*The Diseases in Plants Act of* 1916" has been issued by His Excellency the Governor in Council providing for the treatment of all grape vines affected with this disease. The prescribed treatment provides for at least three sprayings and such further sprayings as may be deemed necessary by a fruit inspector. It is only compulsorily applied when the disease has made its appearance in a vineyard.

Downy mildew can be prevented by systematically spraying the vines before it appears. Growers are urged to spray for their own protection. In respect to sprayings definitely provided for by the Regulation, it is questionable whether the first spraying, which is given just before the buds burst, is actually needed, but it is certainly of great value in the case of anthracnose or "black spot," which is a very serious and common fungoid disease of the vine. It is often found attacking the same plant as downy mildew, and should not be neglected. The second spraying before the vines blossom, that is, when they have grown from 10 to 18 in., protects the new growth from infestation; and the third spraying, given when the blossom has set, protects the foliage produced after the second application.

If the weather conditions are very favourable for the development of the fungus causing downy mildew, viz., warm, moist, or foggy, it may be necessary to give an extra spraying, or even two, between the second and third sprayings, for which the Regulation referred to makes provision. These extra applications may be made even during the blossoming period as it is better to run the risk of losing a few berries than the loss of the whole crop. The number of sprayings necessary after the fruit has set will depend entirely on the weather. If it is warm and dry further applications may not be necessary, but if moist and muggy, spraying must be continued, otherwise the new growth will suffer and the bunches will become affected.

The fungus that causes downy mildew is not merely a surface growth, but it extends right through the vine and is carried over from season to season by the spores that remain dormant in the old leaves during the winter and become active in the spring—probably about the end of September or early in October in the coastal districts, and a little later in inland regions. These spores are carried by the wind, and, if they lodge on the upper side of a moist vine leaf, they begin growth at once, provided the atmospheric conditions are favourable and the leaf has not been protected by spraying with a germ-destroying specific.

The first sign of a disease is a brownish spot on the upper surface of the leaf that looks as though a drop of oil had been deposited upon it. This is known as the "oil-spot" stage. In the course of a day or so a white downy growth appears on the under side of the leaf exactly opposite the "oil spot," and it is from this development that the disease takes its name. This downy growth produces countless spores, which are distributed broadcast by the wind. Each of these spores is capable of reproducing the disease if it comes in contact with a vine leaf under conditions favourable to its development.

When neglected, downy mildew spreads with alarming rapidity when the weather is favourable, and the entire crop of a district may be destroyed in a very short time; hence the great importance of taking precautionary measures.

The plate illustrating these notes gives a good idea of the disease in the "downy" stage, and should enable anyone to recognise it at once. In the later stage of the disease the leaves turn brown, dry up, and fall off, the fruit is destroyed, and, in severe cases all new wood growth is killed, so that not only is there no crop for that season but none also for the following year.

REMEDY.

The remedy for this disease is to give the leaves of the vine a protective covering before the resting spores become active in spring, and to keep them protected as long as risk to the crop exists. The best spray is Bordeaux mixture, 4-4-40; 4 lb. bluestone, 4 lb. quicklime, and 40 gals. water, made according to the directions given in departmental publications dealing with the destruction of fruit and vegetable pests. The spraying material must be neutral; that is to say, it must not contain any free sulphate of copper (bluestone), and this is determined by adding a drop of a solution of fero-cyanide of potassium to a small quantity of the mixture. If there is no

discolouration, the mixture is neutral, but if there is a brown ring round the drop of fero-cyanide, free bluestone is present and more lime must be added. If vignerons have any difficulty of obtaining fero-cyanide of potassium, a small quantity of the solution for testing purposes can be obtained from the Agricultural Chemist.

PLATE 71.—DOWNY MILDEW ON VINE LEAF.

The Regulation referred to is as follows, and must be complied with by every person whose vines are affected by downy mildew:—

> "Every occupier, or if there is no occupier the owner, of any land whereon plants of the genus Vitis (grape vine) are grown shall cause all such plants as may be affected with the disease of downy mildew (Peronosporeæ) to be sprayed with Bordeaux or Burgundy mixture to the satisfaction of an inspector, first when the buds are swelling and prior to their opening, and subsequently once before the vines come into flower, and again immediately the fruit has set. Should downy mildew make its appearance subsequently, further sprayings shall be given as and when an inspector shall direct."

Tropical Industries.

SUGAR FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 21st October, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

"Early in September the Innisfail district, comprising Goondi, Mourilyan, and South Johnstone mills, were visited.

"The town of Innisfail itself was, as usual, very busy, and accommodation very hard to obtain.

"*Goondi.*—A great deal of rain has fallen on this area, delaying planting operations considerably, and also preventing the recently cut ratoons from getting away as they should. Under these conditions, prevailing up to the middle of the month, the task of keeping the mill supplied with sufficient cane was anything but an easy one. About that time, however, a fine spell had set in, and all over the district the farmers were busy. As far as could be ascertained, the several mills in the district will all probably cut short of their earlier estimates, the wet weather being the principal cause, although rats, borers, and, in places, a few grubby patches help to account for the shortage. The borers are very bad this year throughout the district, both plant cane and ratoons suffering. The rat pest is, of course, more apparent on low-lying river and creek banks.

"The principal cane grown is Badila, with some small quantities of H.Q.426, and 7R.428. The demand for new varieties from the South Johnstone Experiment Station has been very keen, and a good deal of E.K.1, E.K.28, H.109, Tableland Badila, Hybrid No. 1, Q.903, Q.813, Q.855, and various other new canes have been supplied. At the Experiment Station the chemist in charge has been kept very busy supplying plants to local centres, and also to the Herbert River, Babinda, and Cairns. Adjoining the Goondi area a good deal of liming has been carried out. I am told that good-quality coral sand is being sold at £3 per ton locally, whilst burnt coral lime is worth £4 per ton. Some farmers are manuring heavily, and quite a number of tractors are in use in this prosperous centre.

"*Mourilyan Mill.*—In this area conditions are practically similar to Goondi. As regards lime, however, they are not so well situated as the Goondi growers, as the extra cost on the Mourilyan side of the river makes it very expensive to handle. I am informed that some 500 tons of manure, consisting principally of basic super, Shirley's Three Sevens, meatworks, dried blood, and sulphate of ammonia, have been already ordered on account of next season's crops.

"*Maria Creek Soldiers' Settlement.*—This area will send its cane in to the South Johnstone Central Mill. A considerable improvement was noted since my previous visit, and evidently a vigorous development policy has been carried out by the Supervisor (Mr. Martin).

"The ex-soldiers are now very busy clearing and burning off new blocks, taking advantage of some fine weather to get through as much work as possible. There are at present about fifty settlers in residence, some fifteen of them having their wives with them. New men are continually arriving, and the place promises to be a very busy one in the near future. The cane seen is backward, but looks fairly healthy and very green.

"The cane area is now as follows:—

Planted 1920	187 acres
Planted 1921	100 acres
To plant 1921	370 acres
To plant 1922	120 acres
	777 acres

giving a total of nearly 800 acres for 1923.

"The Railway Department is pushing the line connection ahead as rapidly as possible, and about the end of November should see the settlement linked up with the South Johnstone Central Mill and Innisfail. The cane now being grown is Badila, but Mr. Martin has also planted out a small plot of new canes from the experiment station.

"*South Johnstone Central Mill.*—This area also comprises Japoon and Liverpool Creek lands. The mill was very musy trying to make up the leeway caused by the late strike, and was getting away with a full supply of cane in good style. Although much valuable time was lost through the strike, both growers and men seem to think that, individually, it has done a certain amount of good, as the present relations are much more satisfactory. As mentioned earlier in these notes, the expected tonnage to be harvested will probably fall below the earlier estimates. Rats and borers have caused considerable damage in the district, but, luckily, the damage from grubs is mainly confined to the 17-mile. Badila represents nearly 95 per cent. of the cane now growing here, but full advantage is being taken of the proximity of the experiment station to obtain plants from there. Not many tractors are in use in the area. Mr. Sugden is now trying the effects of a dressing of lime earth upon one of his cane paddocks.

"*Japoon and Liverpool Creek.*—These areas have also suffered from wet weather, the cane not throwing the growth that it should. In places the trash clings very tightly to the cane, and top shoots are very noticeable. Arrowing here is also as prevalent as in the surrounding areas.

"Considering the weather, it is pleasing to know that the c.c.s. of the cane is very steadily improving. A lot of ploughing and planting is in progress.

"Taking the Innisfail district throughout, it is a very busy one. At South Johnstone, especially, everything is very active, and all hands are doing their best to make up for the enforced idleness of the late strike.

"*Babinda.*—Continuous rain has hindered planting operations. Cane planted later on was looking very fair, whilst the ratoons, although comparing very favourably with those recently visited in other areas, had not the vigorous growth usually so characteristic of this district. Also, although a good deal of 'arrowing' was present, it was not so noticeable as elsewhere. Caterpillars had also attacked and knocked back a lot of the young cane. Badila is by far the main cane grown here, but several growers are trying out new canes from the South Johnstone station.

"Owing to the wet, harvesting operations are very strenuous, and the supply of cane is light in consequence.

"So far the mill officials hope to finish crushing shortly before Christmas, and all hands are fervently hoping for a spell of really fine weather with this in view. As regards pests, the area seen so far is fairly free.

"Borers are fairly active in several places, but the rat pest is not serious."

The Southern Field Assistant, Mr. J. C. Murray, reports, under date 21st October, 1921, as follows:—

"In the course of September, Childers, Nambour, and Bundaberg were inspected. A visit was also made to Beenleigh in connection with the judging of the cane exhibits at the local show.

"*Childers.*—This district is looking very prosperous at present. The cane is cutting well, and the field workers are giving satisfaction. Density is good, and is gradually improving. The most satisfactory variety in this latter respect is Mauritius 1900 Seedling. Other varieties are doing well, farmers having no complaints to make against the returns of D.1135, Black Innis, Petit Senneville, and Q.813.

"The Mauritius cane, Petit Senneville, is not widely grown, but where it is raised the planters like the cane. It is fairly resistant to disease attack, produces good crops, and strikes usually with a low percentage of misses. A characteristic of this cane is that it occasionally shows more than one eye growing near the node.

"Intensive cultural methods are being employed. Many growers contend, and with a certain degree of accuracy, too, that, owing to the rapidity with which unfertilised volcanic soils responded after the rains in mid-autumn, artificial treatment is, on the whole, unnecessary as yet. The red soils are, however, deficient in humus, and while growers may not get positive results immediately following a vegetable manuring, the results of green cropping will prove satisfactory in the end.

"There are not many complaints of disease. Some canes are showing the effect of 'rust' and 'striped disease,' but the areas affected are limited. 'Gumming,' in isolated patches, is slightly depreciating the value of the cane.

"While visiting the Beenleigh Show I met a considerable number of sugar-growers and farmers who are going in for cane. Arrowroot has practically ceased to be a paying proposition, owing to the slump in the market, and the present stability of the sugar industry is attracting the attention of arrowroot planters.

"Of the canes exhibited at the show, none of the later distributed varieties was noticeable, but the exhibit was very fine on the whole, especially the Demerara 1135. However, the growers are in possession now of several new canes sent out by the Bundaberg Experiment Station, and perhaps next year some of these may be shown.

"While in Beenleigh I was much impressed by the general efficiency of the community, and by the standard of the agricultural exhibits generally.

"At Nambour the cane harvest is proceeding satisfactorily. The cane is cutting with good weight per acre, and the c.c.s. tests are well up to the average. Of the varieties being milled from immediately round Nambour, D.1135, H.Q.285, and M.1900 Seedling are making the best showing. Other varieties grown on a lesser scale are giving satisfaction, as also are Reintroduced D.1135, Q.813, Petit Senneville, N.G.16, and Malabar.

"The Nambour area is at present remarkably free from disease and natural enemies to the cane, with, perhaps, the exception of water-rats. The latter come up from the creek, and loss on a minor scale occurs, although the farmers use every effort to check them.

"Up at Mapleton there is considerable activity. Growers have some good cane land free from frosts, with an abundant rainfall. 1900 Seedling is a variety that should do well on these altitudes. D.1135 is at present the staple variety. The growers are recommended to try Q.813, Reintroduced D.1135, Q.970, Q.1098, E.K.1, and Shahjahanpur No. 10. These varieties should do well on the range.

"Conditions in the Bundaberg district are satisfactory. Very few, if any, industrial disputes have occurred, and the mills are smoothly working. Sugar content of the cane is improving as the season advances; also tonnage per acre. The standard varieties are giving good results this crushing, especially 1900 Seedling.

"One grower on the Woongarra area got from second ratoons of this cane 35 tons per acre, with an average c.c.s. of 14.

"Good strikes of young plant cane are in evidence, and the growers have noxious weeds well under control."

ENTOMOLOGICAL NOTES.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, dated 25th October, 1921, from the Entomologist, Mr. E. Jarvis:—

"The weather conditions during the period 27th August to 23rd September have been favourable to the development of our cane beetle, *Lepidoderma albohirtum*, all of which are at present in the pupal state, awaiting those profound changes which will eventually allow them to wing their way to the forest trees, and incidentally into the canefields.

"At our laboratory, the rainfall for this month has been 1.45 in., and the average temperature in the shade 70.5 deg. F.

"NOTES ON MUSCARDINE FUNGUS.

"Readings of the thermometer between the dates 13th to 31st August were particularly interesting, since they helped to illuminate certain matters relating to spore germination of the parasitic fungus *Metarrhizium anisopliæ*. During this period of nineteen days, while the mean shade temperature was 68.6 deg. F., no less than twenty-two third-stage larvæ of albohirtum were killed by this fungus.

"These grubs, which had been paralysed by scoliid wasps (*Campsomeris tasmaniensis* Sauss.) had lain in shallow earthen cells for about two weeks prior to the first fungus attack, so presumably must have become infected by this vegetable parasite in the field before encountering the digger-wasps. Germination of the spores, however, did not take place until the abovementioned temperature prevailed, although during this fortnight preceding the first outbreak of the fungus fifty or more paralysed grubs had been lying in our breeding-trays under exactly similar conditions of handling. The only apparent difference was that the maximum and minimum shade temperatures during that two weeks were 75.5 deg. and 50.8 deg. F., respectively.

"Thus, it appears likely that this slight variation (an additional 2 deg. in the average maximum, and 8.7 deg. in the minimum temperatures) is sufficient to cause germination of the spores of metarrhizium.

"It may be mentioned here that our highest mortality occurred during a mean shade temperature of 67.8 deg. F.

"The above observations will, it is hoped, prove helpful during future experimentation in connection with control work against our various cane pests.

"BREEDING DIGGER-WASPS.

"Four years ago the writer studied the life-history and habits of two native species of *Scoliidæ* that are parasitic on the grubs of our cane-beetles, and succeeded in breeding from the eggs three successive broods of wasps in the one season. The winter brood, however, was not followed up at the time, so is being investigated now, and some further interesting data has been secured.

"Cool winter conditions, as might have been expected, somewhat retard development of the various stages of these parasites. The eggs, for instance, which during summer weather hatch in three days, took from seven to ten days, or even longer; and the period occupied by the combined egg and maggot stages varied from eighteen to twenty-four days under an average shade temperature of 68 deg. F. These combined stages in the summer brood, however, during January occupy a period of only twelve days, the average temperature at that time being much higher (about 82 deg. F.).

"The method of handling larvæ and pupæ of digger-wasps adopted by the writer in 1918 is illustrated in the accompanying photograph of a portion of a breeding-tray stocked with rows of victimised grubs, together with egg, maggot, and cocoon stages of the parasite.

"Each wasp is confined in a small metal cage enclosing a cane-grub covered by about 14 cub. in. of soil, the helpless grub being removed daily and a healthy one supplied. The paralysed hosts are then transferred at once to a breeding-tray of damp compacted soil, in which numerous shallow concavities have been impressed. The wasps are fed daily with honey and water, and, although subjected to close confinement, live about a couple of months.

"From data just obtained it appears that there are four broods of the digger-wasps *Campsomeris tasmaniensis* and *C. radula* every year. Those giving rise to what we may term the first or spring brood commence to oviposit towards the end of September, the earliest eggs having been obtained on the 22nd and 27th of that month. Egg-laying, however, becomes general towards the end of October, and the wasps finally emerge from this brood about the middle of December.

"The period occupied by the summer brood, or second generation, extends approximately from middle of December to middle of February.

"The autumn, or third generation, originates from wasps emerging throughout March, oviposition occurring from about the end of that month to beginning of May, and flighting of the adult wasps from May to August.

"Eggs producing the winter brood are laid in June and July; and at present we have only cocoons, from which wasps of the fourth generation are expected to emerge in a week or so.

"Further details of technique employed in this connection need not be given here, but it may be of interest to state that in the event of our deciding to introduce wasp parasites from other countries, we shall be in a position to handle them during transit in a manner best calculated to keep them alive and ensure successful introduction.

"THE CANE-BORER AND ITS PARASITE.

"A trip was taken to Babinda on 31st August. and again on 19th September, with the object of securing specimens of Tachinid fly parasites (*Ceromasia sphenophori*). Thanks to the courtesy of Mr. A. McColl, manager of Babinda Central Mill, I was enabled to visit Meriwinni, Mooliba, and other districts, in company with one of the cane inspectors, Mr. G. Robinson.

"As a result of our investigations a number of Tachinid flies were captured, with which to commence breeding experiments at Meringa.

"These were found resting on loaded trucks of cane, some in the mill yard and others at Mooliba. Pupæ of the fly were also located in borer-infested cane from several farms, so that it should not be a difficult matter to breed hundreds of specimens of this parasite for future liberation in districts affected by the beetle-borer around Babinda and Gordonvale. Growers in the former area that may be troubled with the borer are, therefore, asked to forward samples of infested stalks to Meringa railway station for examination. It would not be much trouble to cut a sack-full of badly bored cane; and such consignments would be of considerable value to us, and receive due acknowledgment and report.

"The fact of this parasite being in evidence at present on farms that are suffering greatly from borer attack indicates either that its work is inefficient, or that its increase is being constantly checked in some way. Unfortunately, burning of the trash, although doubtlessly helpful in controlling the borers, destroys also its parasites. Continued indiscriminate burning would, before long, probably result in

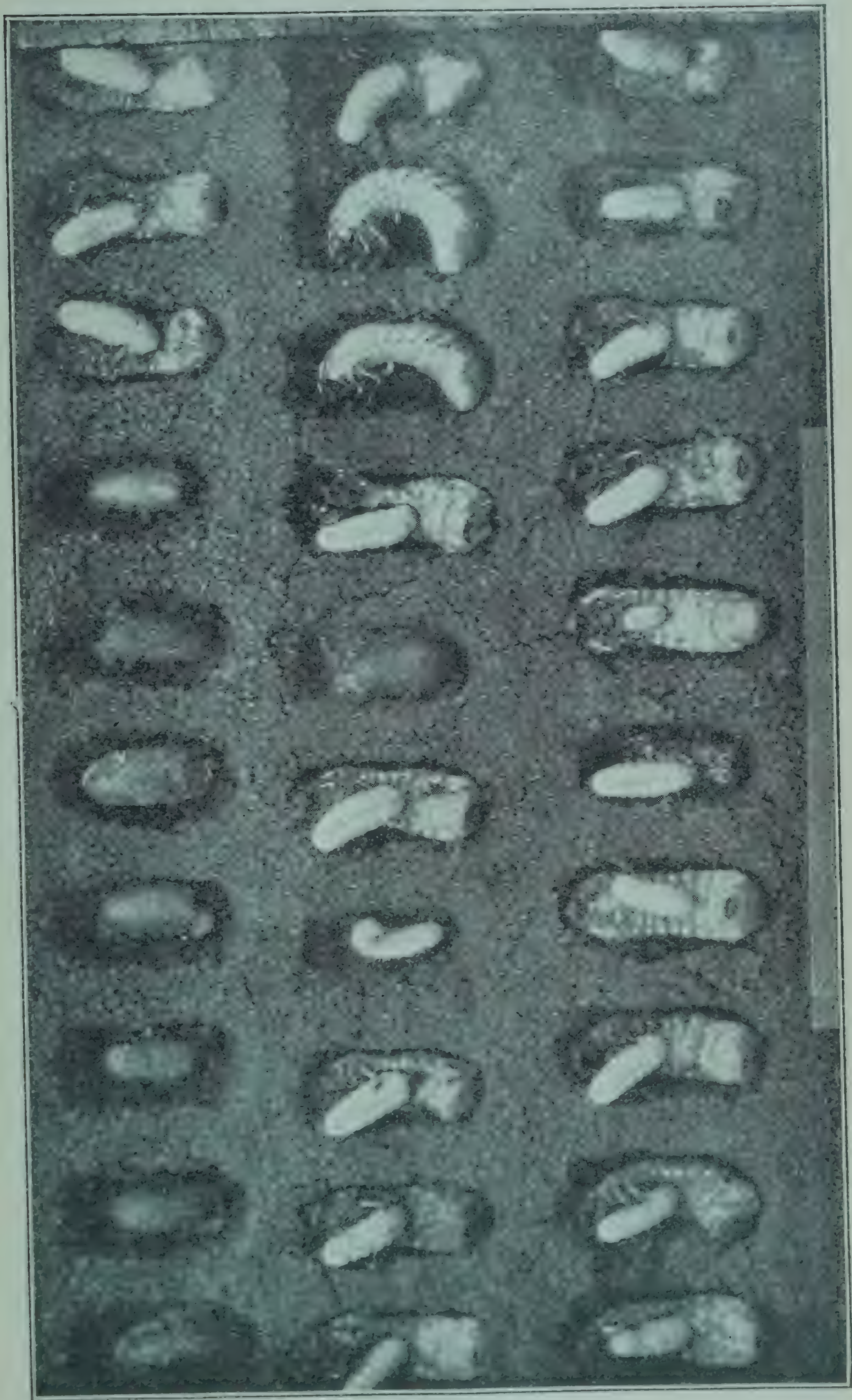

Photo. by E. Jarvis.]

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PLATE 72.—PORTION OF BREEDING-TRAY HOLDING LIFE-CYCLE STAGES OF THE DIGGER WASP (*Campsomeris tasmaniensis* Sauss.); half natural size.

disappearance of the fly from such localities. A small patch of bored cane should accordingly, when possible, be reserved in some obscure quarter as breeding-ground for the fly, and this should not be burnt.

"Bait collecting has achieved great results in times past; and since this method of control is within reach of every grower, and affords a means of materially checking the ravages of this pest, its merits should not be altogether overlooked. These baits consist, as most growers are aware, merely of pieces of split cane about 18 in. long, which are placed in heaps—of from ten to twenty pieces—near or among the cane plants. As a result of rather extensive experimentation in Fiji, it was seen that molasses smeared on the baits did not make them more attractive, and that baits cut from decomposing canes attracted far more borers than those consisting of fresh cane. It appears, also, that collections made every second day from heaps placed near the border of a plantation gave better results than frequent collections (three times a day) derived from single baits laid throughout the field.

"With regard to the question of collecting the beetle-borer, I may mention that about 3,600 specimens weigh 1 lb., and that this number of weevils is able to destroy at least 5 acres of cane. In cases of severe infestation it would, I think, be well worth our while to collect them. By laying bait-traps immediately after cutting the crop, large numbers can be caught at little expense, as the beetles that have been dislodged from the cane usually concentrate on these baits for many days after the crop has been cut.

"Some plants of the cane H.146, a variety which is said to be resistant to attacks from the beetle-borer, have just been received from the General Superintendent, and a grower at Gordonvale has been kind enough to plant them among a patch of D.1135, on land that is usually favoured by this pest. It will be interesting to note, later on, whether the borer-beetle attacks the surrounding cane in preference to the variety in question."

DESCRIPTION OF PLATE.

Row 1.—Cells Nos. 1 to 10; maggots of wasps feeding on cane-grubs.
Row 2.—Cells Nos. 8, 9; eggs of wasps attached to grubs, near legs.
Row 3.—Cells Nos. 1 to 7; cocoons of wasp.

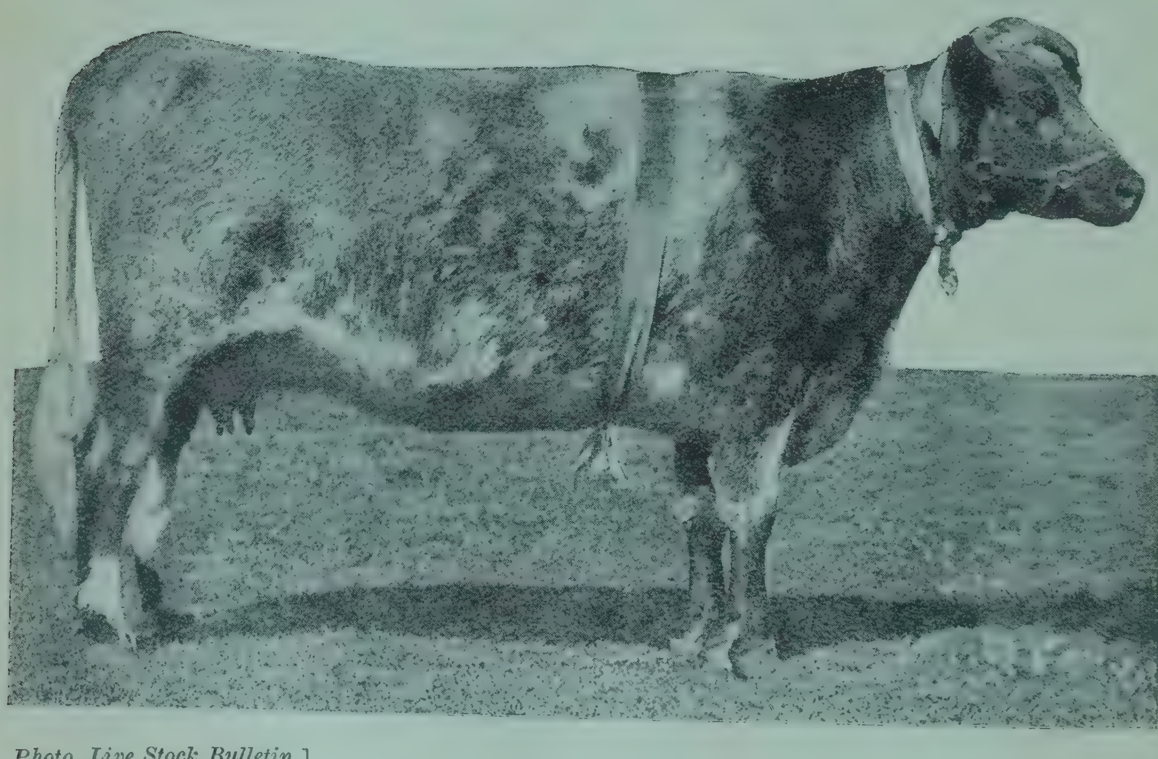

Photo. Live Stock Bulletin.]

PLATE 73.—LYNDHURST PRINCESS IMPERIAL, THE PROPERTY OF MR. C. E. McDOUGALL. First Prize Shorthorn Cow, 4 years or over; and First for Cow with Calf at Foot, Brisbane Exhibition, 1921.

Chemistry.

ANALYSES OF FERTILISERS.

By J. C. BRUNNICH and A. F. BELL.

As the **value** of any **artificial fertiliser** depends entirely on the relative amounts of the principal constituents—**nitrogen, phosphoric acid, potash,** and **lime**—contained therein, it is customary to analyse samples of fertilisers on the local market from time to time.

For the protection of the farmers and fruitgrowers, Fertilisers Acts are framed, and as our Department found that " The Fertilisers Act of 1914 " did not prevent the sale of inferior products, of very varying composition, as fertilisers, the powers under this Act were extended by " The Fertilisers Act Amendment Act of 1916."

The definition of **" Fertiliser "** under the combined Acts reads:—

> "Any substance or compound containing in appreciable quantity nitrogen, phosphoric acid, potash, or lime, manufactured, produced, or prepared in any manner for fertilising the soil or supplying nutriment to plants; also any excrement of animals or any natural substance or natural product which is used for fertilising the soil or supplying nutriment to plants: Provided that the term does not include farmyard manure, stable manure, seaweed, crude nightsoil."

It will be seen that now only such products as **stable** and **farmyard manure, crude nightsoil,** and **seaweed** may be sold as manures without guarantee of composition; any other crude product, or offal, if specially treated or not, will be classed as a fertiliser if sold for the purpose of fertilising the soil.

No person shall sell fertiliser unless he is **licensed** as a **dealer** under the Act.

Any person who desires to become licensed as a dealer shall apply in writing to the Minister for Agriculture and Stock, in the form of Schedule I. of the Act, and transmit the prescribed fee of one guinea. Such license has to be renewed annually.

As under the present amended Act lime and crude fertilisers are included, any person desiring to sell **lime, limestone, screenings, coral sand, sheep Manure, bat guano, ashes,** &c., to farmers for fertilising purposes must apply for a license.

On or before the 31st January in each year, every dealer shall deliver to the Under Secretary of the Department of Agriculture and Stock a **certificate,** in the form of Schedule III. of the Act, of the specified ingredients of each brand of fertiliser sold by him. Such statement may be amended at any time during the year.

Such **certificate** of **fertiliser** shall set forth the full name and place of business of the dealer, the name of the fertiliser, and the figure, or trade mark, or sign under which such fertiliser is sold, and a chemical analysis certifying that such fertiliser contains certain amounts of specified ingredients, and, in the case of bonedust or bonemeal, basic slag or Thomas's phosphate, air-slaked lime, agricultural lime, and gypsum, the percentage of fine and coarse material.

Upon the **sale** of any fertiliser, the dealer shall, at the time of sale or before delivery of the same, give to the buyer an **invoice certificate** signed by the seller or his agent, stating the full name and place of business of the dealer; the name, trade mark, brand, or sign used to mark packages containing such fertiliser and used to identify such fertiliser; the quantity or net weight of fertiliser comprised in the sale; the composition of the fertiliser, setting forth the proportion per centum in which such fertiliser contains the following ingredients:—Nitrogen, phosphoric acid, potash, and lime, and the respective forms in which they respectively occur ; and, in the case of bonedust, basic slag, agricultural lime, &c., the percentage of coarse and fine material.

Furthermore, every dealer who sells fertiliser, which term includes offering or exposing for sale and having in possession for sale, shall securely **affix** to each package a printed **label,** clearly and truly certifying:—The number of net pounds of fertiliser in the package; the figure, trade mark, or sign under which the fertiliser is sold; the chemical composition of the fertiliser, in the same manner as stated on invoice certificate; and the state of fineness for certain fertilisers.

A certain amount of **latitude** in the composition is allowed under the Act, in order to allow for slight variations in manufacture; and the **deficiency** between the amount of fertilising ingredient found and the amount guaranteed on the invoice and labels, must, in the case of nitrogen and potash, be now more than 5 per cent. or 1/20 of the total amount of nitrogen or potash certified to be present, and in the case of phosphoric acid and lime not more than 7 per cent. of the total amount.

On all schedules and labels the amounts of fertilising ingredients have to be stated in a uniform manner, as the old expressions—like bone phosphate, tricalcic phosphate, ammonia, ammonium sulphate, potassium sulphate, &c.—are liable to mislead the farmer. The Act provides for the statement of the valuable fertilising ingredients in percentage amounts of **Nitrogen** (N), **Potash** (K_2O), **Phosphoric Acid** (P_2O_5), **Lime** (CaO).

The **conversion** of the amount of **fertilising compound** into another is very simple, and, as many old manuring formulae still give the old denominations, we will herewith give a table which can be used for such calculation:—

Amount of—		Multiplied by—	Gives the Coresponding Amount of—	
Ammonia	NH_3	0·824		
Ammonium sulphate... ...	$(NH_4)_2SO_4$	0·212	Nitrogen, N	
Sodium nitrate (Chili saltpetre) ...	$NaNO_3$	0·165		
Potassium nitrate (saltpetre) ...	KNO_3	0·139		
Nitrogen	N	1·214	Ammonia, NH_3	
Nitrogen	N	4.714	Ammonia sulphate	
Potassium sulphate	K_2SO_4	0·541		
Potassium chloride or muriate ...	KCl	0·631	Potash, K_2O	
Potassium nitrate	KNO_3	0·466		
Potash	K_2O	1·850	Potassium sulphate	
Tricalcic phosphate (bone phosphate)	$Ca_3P_2O_8$	0·458	Citrate insoluble	
Monocalcic phosphate (superphosphate)	$CaH_4P_2O_8$	0·607	Water soluble	Phosphoric acid P_2O_5
Tetracalcic phosphate	$Ca_4P_2O_9$	0·391	Citrate soluble	
Limestone, marble	$CaCO_3$	0·560	Lime, CaO	
Gypsum...	$CaSO_4$	0·411		

Lime may be used in several forms, and the amended Act provides for four classes—

(a) **Caustic lime,** or burnt lime, or quicklime, containing the lime in form of calcium oxide (CaO);

(b) **Mild lime** or air-slaked lime, containing the lime chiefly in form of hydrate of lime ($Ca(OH)_2$), obtained by slaking of burnt lime with water;

(c) **Agricultural lime,** containing lime in the form of carbonate of lime ($CaCO_3$), and obtained by crushing or pulverising of limestone, marble, coral, and shells;

(d) **Gypsum,** containing lime in the form of sulphate of lime ($CaSO_4$).

The action of lime in form of powdered quicklime or air-slaked lime is very rapid and powerful, and application is only recommended to very stiff clayey and very acid soils. The safest form is generally agricultural lime, but on account of its insolubility the limestone, in order to become gradually available, must be ground very finely, so that the largest percentage goes through a sieve with forty meshes to the linear inch or 1,600 meshes to the square inch.

In many cases a mixture of quicklime and crushed limestone is found particularly beneficial, combining the quick and slow actions of the two forms; and when, for instance, 1 ton of lime per acre is recommended to be applied, a mixture of 5 cwt. of air-slaked quicklime and 15 cwt. of crushed limestone or agricultural lime could be used.

With reference to "**Mixing of Fertilisers,**" a short article was published lately in the August number of this Journal.

The **monetary manurial value** per ton has been fixed for some time under "The Profiteering Prevention Act of 1920." The **unit values,** which are the cost price of 1 per centum of the various fertilising constituents per ton, or the actual cost value of every 22.4 lb. of such constituent, have been fixed as follows:—

	s.	d.
Nitrogen—		
In dried blood	26	0
In bone, flesh, and offal, fine	24	0
In bone, flesh, and offal, coarse	21	0
In bone, flesh, and offal, unspecified	17	0
In bone, flesh, and offal, unspecified lumps	14	0
In nitrate of soda	35	6
In ammonium sulphate	23	0

	s.	d.
Potash—		
In sulphate of potash	18	0
In muriate of potash	12	0
Phosphoric acid—		
As water soluble in superphosphate	9	3
As citrate soluble in basic superphosphate and Thomas's phosphate	9	0
As citrate soluble in finely ground island phosphate and guano	5	6
As bone, &c., fine	5	6
As bone, island phosphate, and guano, coarse	4	3
As finely ground mineral rock phosphate	4	3
As bone, island phosphate, guano, unspecified or unspecified lumps	3	0
Lime as ground lime carbonate	1	0

From these unit values the **cost** of any fertiliser may be calculated, and, for instance, the local cost of "Orchard Manure" No. 211, containing 2.7 per cent. nitrogen, 16.8 per cent. total phosphoric acid, of which 14.5 per cent. is water soluble and .8 per cent. citrate soluble, and 4.1 per cent. of potash, would be as follows:—

	£	s.	d.
2.7 per cent. nitrogen as ammonium sulphate, at 23s. ..	3	2	1
14.6 per cent. phosphoric acid as water soluble, at 9s. 3d. ..	6	15	1
.8 per cent. phosphoric acid as citrate soluble, at 5s. 6d.	0	4	5
1.4 per cent. phosphoric acid unspecified, at 3s.	0	4	2
4.1 per cent. potash as muriate, at 12s.	2	9	2
Mixing charge	1	0	0
	£13	14	11

In many cases specified charges for freight, rebagging, and retailing are allowed, and additional costs for fertilisers sold and manufactured north of Mackay.

A considerable reduction in these costs is to be expected shortly, and ammonium sulphate and also potash salts can be already imported from the South at lesser cost.

Any reduction in the cost of fertilisers is of vital importance to agriculture, in order to allow a much more extensive use. The proper use of fertiliser is fully explained in a little pamphlet, **"Complete Fertilisers for Farm and Orchard,"** which may be obtained on application from the Department of Agriculture and Stock.

We have numerous instances of the **excellent results** obtained by fertilising and liming soils, and it is interesting to record that, in spite of highly fertile lands available and in use for pineapple culture in Queensland, record crops were grown on comparatively poor sandy soils by judicious application of **lime** and **artificial fertilisers.** On the same farms timely application of certain nitrogenous fertilisers, recommended by us, to crops, which due to adverse climatic conditions were very backward and promising failure, produced immediate recovery and excellent yield.

Any farmer in doubt about the quality of fertiliser purchased should at once apply to the nearest inspector under the Act, in order to let him draw a sample and submit same for analysis. All inspectors appointed under "The Diseases in Stock Acts, 1896 to 1898," "The Diseases in Plants Act of 1896," "The Dairy Produce Acts, 1904-1911," and the expert and inspectors under "The Pure Seeds Acts of 1913 and 1914" are officers under the Fertilisers Act.

Under the Fertilisers Act samples of the various fertilisers on the market were obtained and analysed. The results are given in the following table, and in the few cases where **deficiencies** in the fertilising ingredients were found the **values** are **printed in heavy type.**

We also give a table showing the fertilising value of **wood and plant ashes.** It will be noticed that the actual percentages of ash obtained in most cases are very small, and that the ashes of most of our timbers contain large amounts of lime. From prickly-pear we get an average of about 2 per cent. of crude ash, which contains 9.5 per cent. of potash, so that 1 ton of our ordinary pest pear would yield about 4 lb. of potash if all the ash could be collected.

A table giving the manurial value of the **excreta** of the different **animals**, and also of the materials commonly used as **litter,** &c., is added for general information.

Analyses of Fertilisers.

Lab. No.	Fertiliser.	Where Obtained.	Nitrogen, N.		Phosphoric Acid P_2O_5.						Potash, K_2O.		Fine.	Coarse.
					Total.		Water Soluble.		Citrate Soluble.					
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	%
190	Dried blood	Q.M.E. Coy.	12·2	11·8	..	..	..	..	..	..	..	..	..	..
191	ditto	A.M.E. Coy. (225)	12·7	13·0	..	..	..	..	..	..	..	..	..	..
192	ditto	A.M.E. Coy. (168)	12·3	13·0	..	..	..	..	..	..	..	..	..	..
193	ditto	Birt and Co.	12·5	12·9	..	..	..	..	..	..	..	..	..	..
194	ditto	Aust. Co-op. Fert.	12·0	12·0	1·8	1·5	..	..	..	..	..	..	..	..
184	Fertiliser	J. C. Hutton	4·7	5·0	17·3	14·5	3·7	4·0	..	..	..	..	..	..
185	ditto	Q. Co-op. Bacon Coy.	5·0	4·7	**13·9**	17·6	..	..	..	..	..	..	..	..
186	ditto	Birt and Co.	5·4	5·0	16·3	17·1	..	..	..	..	..	..	..	..
187	ditto	Baynes Bros.	4·8	4·8	17·2	18·5	..	..	..	..	..	..	..	..
188	ditto	A.M.E. Coy.	6·3	6·5	12·6	11·0	..	..	..	..	..	..	..	..
189	ditto	Foggitt, Jones	4·3	4·3	17·2	17·9	..	..	..	..	..	..	..	..
195	Natural guano	State Produce Agency	·3	·15	13·3	12·0	..	..	..	..	1·1	·5	..	..
196	Holbourne Island (Phosphate, &c.)	Aust. Co-op. Fert.	..	..	22·1	17·0	..	..	10·4	8·0	..	..	..	..
197	Bonemeal	A.M.E. Coy.	3·7	3·5	24·6	25·0	..	..	..	..	..	..	32·8	67·2
198	ditto	A.C.F. (Jordan's)	3·2	3·5	25·2	21·0	..	..	..	..	..	..	**26·8**	73·2
199	ditto	A.C.F. (Runcorn)	3·4	3·7	26·0	22·0	..	..	..	..	..	..	**28·7**	71·3
200	ditto	H. A. Petersen	**3·3**	3·8	24·8	24·0	..	..	..	..	..	..	**21·8**	78·2
201	ditto	E. A. Jordan	**3·2**	3·8	23·6	24·0	..	..	..	..	..	..	**30·5**	69·5
202	ditto	Webster and Co.	3·4	3·1	25·2	24·0	..	..	..	..	..	..	**33·4**	66·6
203	Ammonia sulphate	Aust. Co-op. Fert.	21·1	21·0	..	..	..	..	..	..	..	..	..	..
204	ditto	N.Z.L. and M. Agency	20·0	20·0	..	..	..	..	..	..	..	..	..	..
205	ditto	Webster and Co.	20·9	20·0	..	..	..	..	..	..	..	..	..	..
206	ditto	Brisbane Gas Coy.	21·1	21·1	..	..	..	..	..	..	..	..	..	..
209	Nitrate of soda	Aust. Co-op. Fert.	16·5	15·5	..	..	..	..	..	..	..	..	..	..
207	Muriate of potash	ditto	..	..	..	..	..	..	..	..	57·6	53	..	..
208	Superphosphate	ditto	..	..	21·7	18·0	19·8	17·0	..	·5	..	..	..	..
210	ditto	N.Z.L. and M. Agency	..	..	22·5	18·0	19·8	17·0	..	·5	..	..	..	..
211	Orchard	ditto	2·7	2·3	16·8	14·5	14·6	13·0	·8	·8	**4·1**	4·5	..	..
212	Bone and super.	ditto	2·2	1·5	23·2	19·0	8·4	8·5	5·4	2·5	..	..	..	..
213	Special orchard	ditto	2·7	2·3	15·3	12·8	13·4	12·0	·9	·4	8·1	7·3	..	..
216	Superphosphate	Paul and Gray	..	..	24·1	..	20·1	17·0	..	..	..	..	..	..

Analyses of Wood and Plant Ashes.

—	—	Per cent. of Crude Ash in Wood or Plant.	IN CRUDE ASH: Per cent. Phosphoric Acid.	Per cent. Potash.	Per cent. Lime.
Apple-tree (*Angophora*)	..	..	·3	4·5	29·9
Banana plant (Cavendish) ..	Buderim ..	1·3	1·5	36·6	21·3
Belar	..	..	·02	4·9	49·1
Blackbutt (*Eucal. pilularis*) ..	Yandina ..	·1	2·7	15·9	14·4
Bloodwood, red (*Eucal. corymbosa*)	ditto ..	·08	2·0	12·7	12·5
Ditto	Bunya ..	·07	5·0	13·3	17·8
Blue gum (*Eucal. tereticornis*) ..	ditto ..	·13	14·0	9·1	19·2
Bottle-tree (*Sterculia rupestris*) ..	..	2·0	·2	29·0	23·5
Brigalow (*Acacia harpophylla*) ..	..	..	..	·9	54·4
Bumpy ash (*Flindersia Schottiana*)	..	·5	2·2	20·5	51·9
Camphor laurel	Brisbane ..	1·0	6·3	36·3	23·0
Cedar, red (*Cedrela australis*) ..	..	·8	9·4	19·7	39·2
Cotton, pods	..	5·3	2·2	29·9	8·3
Crow's foot elm	Atherton ..	..	6·2	5·8	46·9
Forest oak (*Casuarina torulosa*) ..	..	·4	1·6	11·9	64·6
Gidgea (*Acacia homalophylla*) ..	..	..	·9	1·1	48·7
Grey gum (*Eucal. propinqua*) ..	Bunya ..	·2	6·5	11·4	28·9
Hoop pine (*Auracaria Cunningh.*)	Ipswich ..	·7	1·0	17·9	48·7
Ironbark, red (*Eucal. siderophloia*)	Bunya ..	·08	3·9	6·4	22·8
Lantana (whole shrub)	..	..	3·6	14·0	17·0
Lantana (leaves and twigs) ..	..	..	3·5	11·8	11·5
Mangrove (leaves and twigs) ..	Russell Isl.	..	2·0	8·1	16·0
Mangrove (leaves and twigs) ..	Sandgate ..	..	2·1	4·4	12·3
Mangrove (black)	Cairns ..	..	·6	1·3	35·9
Nettlewood	Crow's Nest	3·4	4·1	6·5	28·1
Oregon pine	..	·8	·5	1·3	29·1
Pineapple, whole plant, rough and smooth	Nundah, &c.	1·1 to 2·6	2·2 to 6·0	9·3 to 15·0	5·8 to 7·0
Prickly-pear (*Opuntia inermis*) ..	Dulacca ..	1·2 to 2·6	·5	9·5	19·9
Red stringy bark (*Eucal. resinifera*)	Yandina ..	·05	·8	9·2	17·3
Sawmill ashes (chiefly pine) ..	..	..	1·1	8·7	34·1
Sawmill ashes (chiefly hardwood)	..	..	·6	1·9	29·3
Scrub box (*Tristania conferta*) ..	Yandina ..	·8	·3	7·9	31·1
Sisal hemp	Isis ..	..	4·6	8·0	31·9
Stinking Rodger (*Tagetes glandulifera*)	Maroochy..	2·6	15·8	20·0	27·2
Sugar-cane tops	..	1·5	4·9	13·0	6·8
Sugar-cane trash	..	6·6	3·2	4·9	4·0
Tallowwood (*Eucal. microcorys*) ..	Yandina ..	·2	·4	2·4	52·2
Tobacco plant	..	..	5·4	27·1	40·7
Turpentine (*Sincarpus laurifolia*)	Yandina ..	·4	·4	1·2	1·9
Yellow stringybark (*Eucal. œmenoides*)	Bunya ..	·06	2·1	9·5	9·5

Composition of Excreta and Litter.

—	Percentage of:					
	Water.	Organic Matter.	Nitrogen.	Total Ash.	Phosphoric Acid.	Potash.
Horse dung	75·8	21	·5	3·2	·3	·4
Horse urine	90·0	7	1·5	3·0	trace	1·6
Cow dung	83·5	14·6	·29	1·9	·2	·1
Cow urine	93·8	3·2	·6	3·0	trace	1·3
Sheep dung	65·5	31·4	·6	3·1	·3	·2
Sheep urine	87·5	8	1·9	4·5	trace	2·3
Pig dung	79 to 84	10 to 15	·4 to ·7	3 to 5	·1 to ·4	·3
Pig urine	97·5	1·5 to 2·8	·4	1 to 1·5	·1	·7 to ·8
Hen manure	59·7	29·4	·8 to 1·6	8·4	·5 to 1·5	·6 to ·9
Litter—						
Straw (cereal) ..	12 to 21	75 to 83	·3 to ·9	3 to 8	·2 to ·3	·5 to 1·1
Straw (leguminous)	12 to 22	76 to 83	1·2 to 2·0	3 to 9	·3 to ·4	·6 to 1·8
Leaves, dry ..	13 to 15	78 to 81	·8 to 1·4	4 to 6	·2 to ·3	·2 to ·4
Sawdust	32·5	62·3	·8 to 1·0	·3 to 2	·05	·10
Tannery refuse	6·4	33·8	·2	..	·04	·08
Human excreta ..	77·2	13	1·0	3·0	1·1	·25
Human urine	95·9	4	·6	1·0	·17	·20

Photo. Live Stock Bulletin.]

Plate 74.—Segis Pietertje Prospect.

An American Friesian, the new World's Champion Milk Producer. Official test figures at age of 6 years :—1 year, 37,384 lb. milk, yielding 1,445·9 lb. butter ; 7 days, 33·18 lb. butter.

CATERPILLAR PLAGUE.*

(*Leucania unipuncta,* Haw.)

By HENRY TRYON, Entomologist.

(PLATES 75, 76, and 77.)

INTRODUCTORY.

AT two periods of the year—September-October and March-May—reference may be found in the Press to serious ravages committed on pasturage and cereal crops by caterpillars. These caterpillars are the young of two night-flying moths, known, respectively, as *Leucania unipuncta*, Haw. (*extranea*, Gn.) and *Spodoptera mauritia*, Boisd.† Of these, the former is the insect that is generally concerned, and is the one to which subsequent remarks will be confined.

This insect is one whose range of occurrence is very extended, being met with, according to E. Meyrick, not only in Australia and New Zealand, but also in Europe, Southern Asia, and North America. In the last-mentioned region it bears the significant name of "army worm."

As a caterpillar, a chrysalis, or a moth, it is to be observed in districts that it affects throughout the year in varying degrees of prevalence. It has many enemies. Not only do birds devour it, but it is the prey also of many carnivorous insects. It is, however, most effectually held in check by internal parasites and disease—both fungus and bacterial; and, moreover, special meteorological conditions determine the death of its eggs. Under ordinary circumstances these factors prove competent to hold it entirely in subjection; and it is only when, under conditions that are not fully understood, their operation is temporarily suspended, that a caterpillar plague manifests itself. The occurrence of the insect in formidable numbers is also the occasion for its enemies to assert their fullest influence. Hence it usually happens that a district is rarely visited in successive seasons by this pest, and, indeed, years may sometimes elapse between one visitation and another.

NATURE OF INJURY.

The caterpillars consume the foliage and stems of various species of native grasses, also those of introduced kinds—such as Panicum and Prairie (*Bromus unioloides*)—grown for hay or other purposes. They also devour oats, rye, barley, wheat, maize, sorghum, and possibly young sugar-cane; and will sustain themselves by nibbling, and so damaging, the shoots of lucerne, and even those of the potato. In the case of wheat

* This is a reprint of an article that appeared in the *Queensland Agricultural Journal* for February, 1900, *op. cit.*, volume VI., page 135-147, and is issued as relating to a subject of interest at this time of the year.—ED.

† The insect is distinct from *S. acronyctoides*, Guen., of which *S. mauritia* (Boisd.) is a synonym. Hampson in 1909 named it *Laphygma leucophlebia*, Hmps.

not only is the flag consumed but the spikelets of the head may be eaten right back to the rachis, as is represented on Plate 75. Rye in ear they will simply strip of every leaf, the bare stalks and heads alone remaining. Should the cereal not have already flowered, it may be eaten down to the ground: a remark that especially applies to young maize, no vestige of which may remain after caterpillars have passed over a field devoted to this crop. When young wheat has already been cut and tied up, the caterpillars may even eat the top of the shooks back for several inches. And when exceptionally the growth is sufficiently advanced at the time of their visitation, for the crop, after cutting, to be dried for hay without risk of heating, it may be found that it has already become so soiled by the dead bodies of the marauders as to be wholly rejected by the animals to which it is presented, either in the form of chaff or otherwise. Their destructive action, moreover, is not only thorough but it is also extensive. In the district of Ma Ma Creek, quite 200 acres were seriously damaged or destroyed by this pest during September, 1899; and on the Darling Downs caterpillars rendered single plots of barley and wheat, 100 acres in extent, not even available for straw.

THE INSECT.

The special depredator referred to as *Leucania unipuncta* occurs under four different phases or conditions, viz.:—The Moth, the Egg, the Caterpillar, and the Chrysalis.

THE MOTH (*vide* Plate 76, Figs. 1 and 2).—Generally speaking, the moth is clay or fawn coloured, with the forewings—of this colour—very thickly speckled with black, and having a minute white spot in their centres, and the hindwings, that are paler outwardly, blackish-brown. It may measure nearly 2 inches across the wings. The following more detailed description is taken from one of the writer's previous memoirs:—

"*Male.*—Fawn-coloured. When undisturbed the wings are directed backwards behind the body, so as to make an angle one with the other. Their surfaces are inclined, and their outer borders when in this position leave an angle between them. The eyes are brown, large (and hairy). There is a frontal tuft of brown black-tipped scales between the latter; the antennæ are minutely ciliated (in the males). The body is stout and tapers towards the tail, that is terminally tufted. The thorax is clothed with fawn-coloured hairs, and has a faint yellow dark-edged transverse stripe on the forepart between the anterior wings, and two oblique rows of black points on the hinder portion, meeting at an angle on the middle line. The abdomen is lighter brown, and without crests. The forewings are elongated, their anterior margin is straight, and their external slightly oblique. Each has a dark discal spot, containing a white point, anterior to which is a light-chestnut suffusion; a short oblique subapical brown streak; a line on the outer margin, and an exterior transverse one, of black points; internal to the latter line and between it and the discal spot is an interrupted waved brown stripe, often scarcely discernible. Hindwing short, broad with apex rounded, and external margin undulated; grey, passing into dark cinereous towards outer border (very distinct beneath); anterior border, yellowish-white; cilia, light-yellowish white. Beneath lighter coloured than above; a longitudinal line containing a few distinct black spots on each side of the abdomen; front border and outer portion of forewings, and fore border of hindwings, with light-black speckled scales; a cloud of dark cinereous colour across the outer third of forewing. Legs light-grey with black specks; fore tibiæ with two and hind tibiæ with four spurs. Extreme length when undisturbed, $\frac{4}{5}$ inch; expanse of wings, $1\frac{3}{5}$ inch; length of body, $\frac{3}{10}$ inch."—*Insect and Fungus Pests*, page 224: Brisbane, 1889.

EGG.—The eggs are spherical, somewhat flattened above, and measure about $\frac{1}{50}$ inch in diameter. Their surface is symmetrically rugose, but this feature is generally obscured by certain sticky matter with which they are covered at the time of their being laid. They are yellowish-

white in colour, but darken with age. (The accompanying figure (1) displays eggs, of nearly natural size, *in situ* on the plant, and their appearance when magnified.)

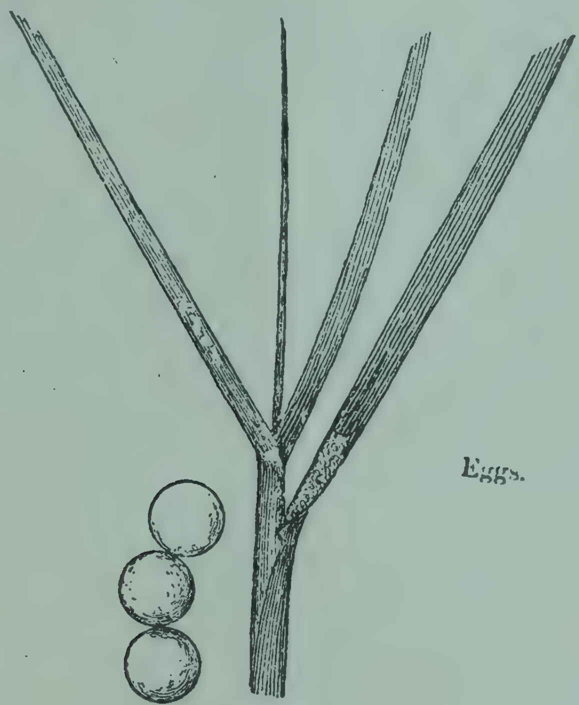

FIG. 1.

THE CATERPILLAR (Plate 76, Fig. 4).—The caterpillars attain a length of $1\frac{1}{2}$ inches and are nearly $\frac{1}{4}$-inch in diameter. They vary in colour with age. Thus, when newly hatched, they are translucent and almost white; then they acquire a greenish tinge, and later they become darker and have stripes that extend along the sides of their bodies. Still later, when about to become chrysalises, they are lighter coloured again, and meanwhile the stripes have changed to a paler hue. There are also dark and light varieties of the same age. The following detailed description will serve to more definitely define the characteristic features of the insect:—

A smooth-surfaced caterpillar, with a cylindrical body gradually narrowed towards the head, more suddenly towards the tail; the twelfth segment without transverse keel above. The mandibles brown bordered with black; the labrum is sinuated anteriorly and whitish; the anterior clypeus is longitudinally wrinkled; the posterior clypeus has a few transverse fine striæ, and is white with a central longitudinal brown mark, or is brown with a white border; top and sides of the head netted white and brown; prothoracic plate (shield behind the head), dark-brown, remainder of body greyish-brown (under the lens appearing mottled-brown on a white ground); thoracic legs, whitish with brown claws; abdominal prolegs, white, each with a transverse broad smoke-coloured band on its outer surface; spiracles, black (under-surface greenish, grey at the sides); two light-yellow broad stripes extend on each side of the back from the fore-border of the prothoracic plate, and are irregularly edged with black above; midway between them, along the centre of the back, is a third stripe of the same colour; this is usually interrupted and very indistinct. Below the dorso-lateral stripes are two bands on each side extending the whole length of the insect—one is along its inferior border contiguous to the spiracles, and the other is below their level. The latter is the more conspicuous, being cream-coloured with the central area mottled with light red. There are a few slightly raised hair-bearing black points on each segment. These number twelve on a segment in the mid-region of the body, the six on each side being disposed as follows:—One above the dorso-lateral line, one in it, one above the spiracle, one below it and on its side, and one at the base of the abdominal proleg. Length of caterpillar, $1\frac{1}{2}$ inches."—*H. Tryon, op. cit.*, page 225.

THE CHRYSALIS (Plate 76, Fig. 3).—This is of the form represented in the figure referred to. At first light-brown, it soon assumes a rich dark reddish-brown colour. It is smooth and shining, and when fully extended measures about $\frac{4}{5}$ inch in length. The three anterior segments, that correspond to the hind body of the future moth, have each on the forepart a row of punctures between the breathing pores (spiracles), and the terminal segment ends in two nearly parallel sharp depressed spines.

HABITS OF INSECT.

The moth, under natural circumstances, is nocturnal in its habits, preferring the early part of the night for its movements. It will, however, take wing during any time of the day, even during the prevalence of bright sunshine, when disturbed. Amongst disturbing agents may be mentioned the wind, especially should the moth emerge from its chrysalis in an exposed spot. Under this circumstance, also, it follows its direction with rapid movement, after taking wing with great suddenness. Whilst engaged in flight it usually passes near the surface of the ground, except during the night, when it may wend its way at a height of some feet therefrom. In settling down it runs quickly to some hiding-place, especially selecting such as presents colouration in harmony with that of its own livery. It feeds upon the nectar of flowers. Some few days may elapse between the emergence of the moth from its chrysalis in the ground and the laying of its eggs. During this interval it conceals itself by day in any vegetable *débris,* sticks, grass, boards, &c., that may be met with in its immediate environment. But it goes forth night after night to feed, many kinds of flowers affording it sustenance. Each female moth—as has been ascertained by other observers—lays from 500 to 700 eggs. The site usually chosen for their reception is afforded by young leafy shoots of some rank growing grass, or of a cereal before any appearance of the flowering-stalk has arisen, especially when thickly sown and each plant resembles a small tussock. In selecting the spot for the reception of its eggs, the parent insect seems to anticipate the requirements of its young, which are protection from light and an abundance of succulent foliage. It, however, prefers that the plant should have arrived at a certain definite stage of growth, choosing such amongst others that, though adjacent, have evinced a less rapid development. This was very noticeable in different stud wheats grown at the Hermitage State Farm in rows side by side and sown at the same time. In this instance such late varieties as Windsor Forest, New White Queen, Selected Square Head, Challenge White, and White Nursery were free from their attacks, whilst other more quickly maturing kinds growing near them were attacked, amongst which latter may be mentioned Allora Spring, Budd's Early, and Gayndah No. 4. The moth usually selects the leaf-sheath, or the spot where the flag comes away from the stem, as the site for its eggs. "When the female moth finds a stalk of grain or grass suited for her purpose, she clasps it with her legs, and thrusts her ovipositor into the unfolded base of the leaf or down into the sheath, where it surrounds the stalk" (*F. M. Webster*). Many eggs are laid together in one position at the same time (*vide* fig. 1, page 333). They are placed side by side in linear series of 20 or more, and enveloped in a sticky substance that causes them to remain adherent to the leaf surface on which they are placed and to one another. C. V. Riley states that exceptionally these are laid "in the cut straw of old stacks, or in hayricks, or even in pieces of cornstalk in the field, or in stubble." These eggs, under favourable circumstances, hatch in about a week or fifteen days. The minute caterpillars on hatching out feed

at first on the shell of the egg whence they have arisen, then on their leafy surroundings at the base of the flags, after which they enter the innermost recesses of the plant (whence they may be shaken out), or even rest immediately beneath it. During this time they inflict no noticeable injury, so that their presence may not even be suspected. Both now and at a later period in their growth, the caterpillars feed almost wholly at night, especially during bright sunny weather. When, however, rain prevails and the weather is overcast, they may crawl to the most exposed portions of the plants whereon they occur, and feed there continuously (they will also similarly remain exposed when victimised by insect or parasites or by disease). When disturbed, they immediately drop from where they were previously feeding—the very young by a thread, the older without any. Having fallen, they quickly roll themselves up with the head inwards, and remain motionless, but after a minute or two they bestir themselves, and soon crawl away. Should the plant on which they feed be isolated or offer little concealment, they spend the day concealed in the nearest hiding-place they can find, as under a stone or piece of wood; also when crawling from place to place they will rest hidden beneath clods of earth or in such like places. When disturbed, especially in cloudy weather, they will frequently, whilst resting on their abdominal prolegs, elevate the forepart of their body, and move their head to and fro with sudden jerks. This also is their habit when attacked by insect parasites, and with the presence of these they probably instinctively associate every threatening danger. When developed to a third of their ultimate size or more, they may travel extensively from plant to plant during the hours of darkness. But when more fully grown they may supplement these nocturnal excursions by much more general ones pursued during the time daylight prevails. Referring to one of these excursions, Mr. G. Anderson, of Oakey Creek, informed the writer as follows:—"The caterpillars appeared to occur throughout 70 acres of barley simultaneously. They were in immense numbers. For three days they were upon the move between the hours of 12 and 3 on each occasion, the moving mass —for such was the appearance, due to their numbers—travelling west." The *Brisbane Courier* of 22nd March, 1898, referring to an occurrence of caterpillars in the Laidley district, stated also as follows:—"Some parts of the district are being ravaged by immense armies of caterpillars that march along and eat up grass, panicum, and even tackle the maize. Some farms in their track have been completely devastated." When in the course of these general movements they have occasion to cross land not occupied by the plants to which they are especially partial, they will nibble others, and so injure them to a greater or less extent. Thus all the shoots of lucerne were seen to be destroyed in one instance in the Ma Ma Creek district; in another case nearly all the young haulms of a considerable acreage of potatoes had been gnawn down. As a rule it is not until the caterpillars are nearly full grown that attention is directed to their presence, which happens then by reason of the extent of their depredations ("the crop looking thin," as is often said) or the occurrence of such a moving host as has been alluded to.

The caterpillar takes from four to five weeks to mature, but this period is subject to variation in length, a circumstance connected with the amount of suitable food that is available for its consumption, as well as the occurrence or absence of congenial climatic conditions. Thus, during the winter, the insect will persist as a caterpillar for quite three months, during a portion of which time it remains in a semi-dormant condition.

When mature, it changes, as previously remarked, to a lighter colour, and its stripes grow paler. It then, under normal conditions, enters the ground to a depth of about 2 inches. Here, still outwardly a caterpillar, it becomes even paler in colour than before, and its body meanwhile becomes considerably shortened. In this position it may remain for two days (this period is also subject to variations in length), during which time, by special movements in different directions, it forms an oblong smooth chamber measuring about 1 inch in length, and meanwhile changes into a chrysalis such as has been described. In exceptional cases, however, it crawls beneath a stone, piece of fallen timber, sod of earth, or "land" in ploughed ground, and then transforms without constructing any chamber, though sometimes it covers itself with earth.

The insect having thus passed into a chrysalis remains in that condition usually for about two weeks; but again the time passed in this phase may vary from ten days to three or four weeks. At the expiration of this period the perfect insect or moth arises, a warm evening after rain being usually chosen for its appearance.

Although the caterpillars occurring even in the same field exhibit great variation in size and consequently in age, there are good grounds for concluding that, generally speaking, there are at least three broods, if not four, every year, although it is only during two periods of the year—September-October and March-April—that they occur of such extent as to prove noticeably destructive; their comparative smallness in the intervening periods being due to the operation of natural checks upon their growth and increase, as well as to the condition of growing crops. These three or four separate broods, however, overlap to a considerable degree. The caterpillars that were observed during 1899 in the Ma Ma Creek district from the second week in August onwards, and which had already transformed—in part—to moths by the third week of September, were no doubt derived from moths that had deposited their eggs, where these caterpillars were met with, in May. It was inferred that a similar state of things had obtained on the Darling Downs, since, in many instances, whereas wheat sown in April or May was subsequently attacked by caterpillars, that which had been planted in the same locality in June and July had escaped their visitation; a remark that also applied to both oats and barley. Where it had been otherwise, there was generally evidence forthcoming to point to a migration of caterpillars from the earlier to the later sown crop. The explanation of this is to be found in the fact that the crops, in order to evince the presence of caterpillars in September, require an access of the moths in May. If this is impracticable, they may escape their presence.

NATURAL ENEMIES.

It has already been stated in the introductory paragraph that under normal conditions the caterpillars of *Leucania unipuncta*, Haw., do not occur in such numbers as to inflict noticeable damage to pasturage, cereal, or hay crops. It is also true that when, under special circumstances, these pests have exceeded these limits in respect to numbers, forces come into operation to restore the balance of Nature by checking the enormous numerical development of these caterpillars that would follow the free exercise of their powers of increase. This experience results from the operations of so-called natural enemies, in which category may be included not only predatory birds and other insects that find sustenance in preying upon their bodies, but parasitic forms of life to which the bodies of these caterpillars serve in the general capacity of host, providing at the same time not only aliment but

dwelling-place also. As an instance of this, a plague of caterpillars caused some consternation by reason of its ravages in the district immediately to the south of Brisbane during March, 1895. The immediate descendants of these marauders still exist, a score of generations having succeeded one another since then; and yet we have learnt of no further trouble from caterpillars in the districts alluded to. But that this would be so was predicted by the writer at the time, after having remarked the extent to which parasitic insects had victimised these grubs concerned in the ravages complained of. And, in addition to the insect parasites, there are also certain fungi (Entomophthoreæ) and bacteria that produce general and fatal disease in the course, too, of their parasitic life in the tissues of these insects.

In the case of the visitations of caterpillars in September-October, 1899, that have suggested the preparation of this article, similar checks on increase were also operative, and no doubt in consequence similar beneficial results to those above alluded to will follow in most of the localities that have suffered. In the present instance parasitic insects were principally concerned, and amongst these the following are worthy of being especially mentioned:—

A.—Insect Parasites.

Theronia rufipes, sp. nov. The Red Ichneumon. (Plate 77, Fig. 2).—This is a deep-red and glossy insect, having smoke-coloured wings that appear steel-blue in certain lights, and the anterior two-thirds of its hind body black and conspicuously spotted with a row of large white spots along each side. Very large female examples may be 11 lines in length, and have a wing spread of nearly 1½ inches, but as a rule in this sex their measurements are respectively 8 lines and 1 inch. These insects during overcast weather may be seen to alight on and explore in plants that are frequented by caterpillars; but it is during the prevalence of hot sunshine that they occur in greater numbers, though their extreme activity then often leads to their being overlooked. At this time, however, they may be remarked, passing rapidly to and fro just above the surface of the grass or cereal crop, ever and anon suddenly alighting and creeping amongst the herbage. Even at nightfall they are still at their posts, remaining three or four together stationary on the grass stems. On discovering a caterpillar they soon settle upon it after exploring it from all sides with their feelers, and notwithstanding the violent contortions into which it throws its head and body. Then they probe it deeply with their black needle-like ovipositor (composed of three separable parts and measuring ⅓-inch in length), and so place within its body one or more of their eggs. It is probably also that at the same time they either disperse in the air or inject into the tissue of their victim a fluid analogous to formic acid that they secrete, and that may serve the purpose either of an anæsthetic or preservative. One, at least, of the eggs of the ichneumon thus inserted hatches into a maggot that feeds within the caterpillar, and continues to develop as the growth of the latter is still continued; but at the same time it avoids touching organs the injury of which would result in speedy death.

Meanwhile, the caterpillar enters the ground, and, in the majority of instances, transforms to a chrysalis. Further transformation on its part is, however, restrained, for, instead of a moth emerging from the ground, there issues the red-bodied ichneumon fly, which digs its way to the surface through a small circular hole, that is sufficiently large to be readily perceived.

In the case of some chrysalises of grass-feeding caterpillars (*Laphygma leucophlebia*) obtained during April, 1895, in the Tingalpa district, through the instrumentality of Mr. A. Grieve, it was remarked that, with the exception of an exceedingly small percentage, all gave birth to these parasites in lieu of moths.

It is, however, in attacking belated caterpillars that these ichneumons are most serviceable. When the *Theronias* emerge from the bodies of their hosts there are always a few caterpillars that have not as yet transformed to chrysalises. These, however, the female ichneumons search out with great pertinacity, and so ultimately destroy. Their presence in numbers on pasturages previously visited by caterpillars is often remarked by graziers, who are led to question the significance of this phenomenon. This happened in the case of the caterpillar plague at Rockville, Mombra, in 1896 (*T. Nicholson*). Mr. A. Grieve, in the instance above quoted, drew attention to the fact that the ichneumons that were hatching out under his observation were nearly all males—a fact that subsequently received corroboration from the experience of the writer. In this instance, moreover, it did not appear that it was a case of protandry, as has been noticed in the case of the related insect, *Pimpla inquisitor*, Say., by C. O. Howard in the United States. "With this species" he remarks ("Study on Insect Parasitism," page 13), "as with so many other parasitic Hymenoptera, and indeed as with so many other insects in general, there was a marked priority in the issue of the males." He then gives a tabulated statement showing that male *P. inquisitor* were appearing for seven successive days prior to the emergence of any female examples of the species.

As this insect does not appear to have been described and is of great economic interest, the following technical description is appended to ensure its correct identification:—

Theronia rufipes, sp. nov.—*Female*: Red, four anterior segments of hindbody, deep bluish black, each with a large ovate white spot on the side adjacent to the hind border, forming a lateral longitudinal series. Wings, fuliginous the fore ones having dark steel-blue reflections, especially towards the base; antennæ outwardly, tarsus of hind legs and ovipositor fuscous. Altogether smooth and glossy. Hindbody impunctate. Head and thorax very faintly punctured. *Head* not lengthened, with straight fore-border; antennæ situated in a broad shallow concavity, eyes excavated opposite the origin of these; vertex narrow with rather sudden occipital slope. *Thorax*, mesonotum without wrinkles; scutellum convex with two lateral keels enclosing a triangular space; meta-thorax wrinkled transversely, and with a central ridge ending in an obtuse tubercle beyond which it is obliquely truncated, two dorso-lateral tuberosities on the margin of the hinder slope form a triangle with the preceding one, meta-thoracic spiracles oblong. *Wings*, pale fuscous, with the stigma and veins black, the latter becoming paler outwardly; areola present, four-sided, the two transverse cubital nerves bounding its meeting on the radial. *Legs*, coxa of hind legs very large, their femora thickened with a tooth on the lower surface behind the middle, middle and hind tibiæ spurred, and with each two terminal spines, claws stout, simple. *Abdomen*, 1st segment oblique, truncated anteriorly; 2nd, 3rd, 4th, and 5th segments with a lateral impression immediatesy above the spiracles extending backwards and outwards; that of the 5th obsolete beyond the base; immediately above this impression, and in front of the white lateral spot on the 2nd, 3rd, and 4th segments is a small tympanum-like spot (*lunula* of Foerster), round on the 2nd segment, oblong on the others; hind border of segments 6 and 7 with deep-rounded excavation extending forwards half the length. *Ovipositor*, $\frac{4}{5}$th length of abdomen. Length (excl. ovipositor) 17 mm.; wing expansion, 28 mm. *Male*: Smaller, five abdominal segments white-spotted, 1st having two on each side (therefore lateral series 6 instead of 4 as in female). Vertex except sides, and occiput except orbital border of eyes; sides of scutellum, and frenum black; scutellum and frenum with raised yellow border.

Exephanes leucaniæ, sp. nov. (Ichneumonidæ.) Plate 77, Fig. 3.)—This ichneumon is a dark-coloured insect, measuring about $\frac{1}{12}$th inch long, having a long band on the hind body; the feelers and legs red;

also several white spots on the thorax present. With regard to it, it may be affirmed that observations point to the conclusion that it does not occur in such numbers as do the other hymenopterous parasites described, but still it was met with on the Darling Downs in such numbers as to indicate that considerable services in checking the increase of the caterpillar moth was being exerted by it. With reference to its movements, it may be stated that it is a far less active insect than is the more prevalent Red Theronia. Only male examples have been reared from victimised caterpillars; but its systematic relations are sufficient evidence that its consort will prove to have a relatively short ovipositor. Probably not more than a single *Exephanes* grub reaches maturity within the body of its caterpillar host. No species of *Exephanes* existing in Australia appears to have been hitherto described. It may be thus characterised:—

Male. Exephanes leucaniæ, sp. nov. Black; antennæ (except two basal joints), labial palps, legs (except coxæ and trochanters of all and special bands on hind legs), 2nd abdominal segment, and 3rd beneath, basal $\frac{2}{3}$ of costa and stigma of forewings horn-yellow to red; front and clypeus (except a triangular patch in the centre), anterior surface of basal joint of antennæ, prothorax above, scutellum, a spot on each side of metathorax behind, two spots at root of forewing, a large spot on the inner aspect of the trochanter of each leg, a lateral spot at the extremity of the 1st joint of the abdomen, pale yellow; hind border of 3rd abdominal segment, wide band on hind border of 4th, and 5th on each side (bands not meeting above) and hind border of 6th, white. Antennæ fuscous towards extremities; tarsi (except proximal $\frac{2}{3}$rds of 1st joint), a broad band at extremity of both tibia and femur of hindlegs black. Entire surface thimble-punctured, frenum and metathorax above rugose; for the most part covered with fine whitish hair. Lower surface of abdomen glossy, otherwise dull. *Thorax* with scutellum evenly convex, separated from mesothorax by a wide smooth sulcus closed on each side by a sharp keel, that borders the mesothorax laterally; metathorax with rounded antero-posterior contour, with a sudden posterior declivity, and with four smooth longitudinal keels proceeding backwards from foreborder, the two lateral ones just above the slit-like spiracles becoming soon obsolete, the two dorsal ones united to the foregoing by transverse keels extending some way down hinder declivity; the latter also enclose a space that is divided into three areas by transverse keels, whereof the anterior one widens in front, and the middle one is square. *Abdomen,* petiole of 1st joint with a low narrow keel on each side beneath, and a dorsal one on each side above the spiracle; 2nd segment with large wrinkled depression on each side adjacent to the fore-border. *Wings* with areola well-marked, the transverse cubital veins, forming it, separated at origin on radial. Discoidal transverse, or 2nd recurrent, with a projection outwards in the middle of its length, a projection inwards also at origin of cubital vein; veins of forewing (except costa and stigma), blackish. Length, 15 mm.; expanse of wings, 23 mm.

3. *Paniscus* (*productus,* Brullé?). [Fam. Ophionoidæ.] (Plate 77, Fig. 4.) This is a large yellowish-brown clear-winged insect, having the hinder body, that is usually held in an arched position, compressed from side to side and widened towards its extremity. It measures nearly 1 inch in length, and has a wing expansion of $1\frac{1}{4}$ inches. Unlike the first-mentioned ichneumon, the sexes in this are much alike. However, the female has a short ovipositor that is not, however, always exserted. It also differs from it insomuch as the *Paniscus* grub is not an internal feeder, although when the caterpillar transforms into a chrysalis it becomes enclosed therein, though covered subsequently by its own special cocoon. It also has a comparatively slow flight, and does not dash hither and thither when on the wing, and in alighting it seems to do so with some hesitation. In attacking a caterpillar it fastens its dark-coloured eggs on the surface near the head. These eggs are pedunculated or stalked, and are attached by these stalks being inserted through and beneath the skin of the victim, this being in the first instance punctured by the parent ichneumon for the purpose. In feeding, the ichneumon grub does not wholly leave the egg-shell whence it has emanated, and ultimately this remains fixed to it at one end.

Only a single ichneumon grub appears to mature in each chrysalis. These brown ichneumons were of very common occurrence amongst the *Leucania* caterpillars met with on the Darling Downs and elsewhere.

Brullé (Lepelletier de Saint Fargeau's "*Histoiré naturelle des Inséctes Hymenopteres,*" IV., p. 156) described in 1846, an Australian species of *Paniscus,* but it does not appear that the present insect is identical with the one noticed by him. The following technical description will serve to distinguish the latter:—

Female.—Yellowish brown, spot on vertex including ocelli, scabbard of ovipositor and claws of feet black; posterior orbital band yellowish; legs passing outwardly to pale testaceous; finely punctured and for the most part clothed with appressed pale-coloured pubescence, a few stronger hairs on fore-border of clypeus. *Head,* depression containing antennary fossæ not divided. *Thorax,* scutellum with disc bounded by straight posteriorly approaching keels; metathorax transversely wrinkled, without distinct surface areas, fore-border roundly excavated, the excavation being bounded by a ridge. *Abdomen,* 1st joint with spiracles long before middle; ovipositor comparatively well developed, measuring when exserted nearly as long as first body segment; hairy divisions of scabbard curved upwards at origin. *Wings* with dark-brown veins and brownish-yellow stigma, areola present, 2nd recurrent (discoido-cubital transverse) continuous with outer cubital transverse, veins interrupted by—usually oval—clear glabrous spaces having the following disposition, one in the middle of 1st abscissa (present) of cubital, one in the outer cubital transverse, two in the 2nd recurrent (discoido-cubital), and one in the discoidal—between origin of sub-discoidal and posterior margin. *Claws* with comb-like teeth—as in other Ophionoidæ. Total length, 20 mm.; expanse wings, 17 mm.; hind legs, 20 mm.

Male.—Smaller, with abdomen more slender, and less wide at extremity. The face is either yellow, or much paler coloured than remainder of body; last abdominal segment represented by two oblong valves instead of a single sheathing scale.

4. *Apanteles ruficrus,* Haliday. [Braconidæ.] (Plate 77, Figs. 5, *5a-b.*) This is a minute insect, measuring about $1\frac{1}{4}$ lines long, with a wing expansion of $2\frac{1}{2}$ lines. It is black in colour, with pale yellowish brown legs (the first joint of the hindmost pair being black), and four clear wings. It is best known from its cocoons, that are small, white, oblong bodies measuring each about $2\frac{1}{4}$ lines in length. They occur side by side, fastened together, by the loose silk that surrounds each, in masses of 50 or 60 together, and are commonly met with attached to the stalks of grain where caterpillars occur. Those whose observations have brought them to light have, however, invariably regarded them as "caterpillar's eggs" meet for destruction. The female insect may, moreover, by close attention, be detected moving at the base of the herbage that is being devoured in quest of its prey, often running for this purpose over the ground. Having found a caterpillar, the *Apanteles* probes it with its ovipositor, and so inserts into its tissue its own tiny eggs by the score. The resulting larvæ feed upon the "juices" of their victim, and so gradually effect its destruction. This is accomplished, however, before the chrysalis stage is reached. The approach of death is heralded by a general torpidity and sluggishness in the movement of the caterpillar, which may, however, crawl aimlessly to exposed situations. But, meanwhile, the young of the parasite which infest it, after raising minute rounded swellings upon its surface opposite where they individually occur, pierce its skin, and immediately on issuing spin their cocoons; and when this has been accomplished, nothing but a shrivelled and darkened skin remains to represent their host.

The Queensland insect appears to be identical with *Apanteles ruficrus* of Haliday, as is seen on comparing it with the very full description of the latter given by Rev. T. A. Marshall [*vid.* Species des Hyménoptères D'Europe. Les Braconides, Vol. I., page 410 (1888)]. This insect, according to the latter authority, occurs in Europe in parasitic relation with no less than seven distinct species of caterpillar, amongst which are included two species of *Leucania—i.e.,* the genus to which our present pest belongs.

This parasite is generally very efficacious in destroying the *Leucania* during the caterpillar phase of its existence. It is, however, itself in turn often preyed upon by a still smaller hymenopteron. This is a bronzy-black insect, measuring about 1 line in length, and is a chalcid-id fly apparently belonging to the genus *Dibrachys*. The *Dibrachys* however, does not appear to attack it until it has accomplished, for a season, its useful work. It may, nevertheless, occur in such numbers as to render the *Apanteles* locally scarce for some considerable time. In the ordinary course of events, each little cocoon in the mass opens at the top by a little cap-like lid as if it had been cut across at this spot, and so the primary parasite emerges. But when the *Dibrachys* has attacked it, the end remains closed, and a small round opening eventually occurs in its wall.

5. *Linnæmyia migripalpus,* n. s. [Fam. Tachinidæ.] (Plate 77, Fig. 6.) This insect, that resembles in general appearance a Meat Fly (*Sarcophaga*), or large house-fly, is very serviceable in preventing the transformations of the caterpillars to egg-laying moths. Where its victims occur, it may frequently be observed slowly wending its way amongst the wheat stalks and constantly settling thereon. It measures, as a rule, about $\frac{5}{12}$ inch in length, and is of a greyish colour, has an ashy white face, a dark-striped thorax, more or less pale brown upon the hind body, and brownish-yellow legs with black feet. It is, moreover, clothed with numerous stout black bristles and stiff hairs. Its habit is to glue one or more of its numerous eggs to the surface of the body of the caterpillar it attacks. These, on hatching, produce tiny maggots that bore their way into the tissue of their host, and feed thereon until fully developed; and then, without fabricating any special covering, they transform into pupæ within their own hardened, discoloured skins, becoming smooth, dar-brown or nearly black, cylindrical, objects with rounded ends.

The caterpillar has meanwhile entered the soil and become a chrysalis, though it would appear that sometimes the victim is not able to reach this degree of development. In the latter event the pupæ of the parasite are exposed in the soil instead of remaining within the protecting covering otherwise available.

The period that elapses between the attachment of the egg of the Tachinid parasite to the caterpillar and the appearance of the fly is about three weeks; but this is subject to variation as the result of special climatic and other conditions.

The percentage of caterpillars victimised by this fly, in any of the occurrences of this grass-marauder that have been observed in Queensland, has not been estimated. There are, however, grounds for concluding that in some instances it is very large.*

The following description will serve to identify this parasite:—

Linnæmyia nigripalpus, sp. nov.—*Head* with frontal vitta wax-yellow coloured; face, cheeks greyish white; 2nd joint of antennæ grey above; "beard" white. Head narrower at level of vibrissæ than at origin of antennæ. Two stout macrochetæ on vertex behind ocelli, orbital bristles present; three smaller bristles above vibrissæ,

* Related Tachinid parasites of *Leucania unipuncta* have been met with in other countries. Thus F. M. Van Der Wulp has described, as occurring in British India, a Tachinid parasite of *Leucania extranea*, Guen. (synonymous with the *Leucania* under notice), with the designation *Masicera castanea* (Indian Museum Notes, III., page 12, 1894), from which the present insect differs by marked structural features —the minute palpi and hairy eyes, amongst others, D. W. Coquillet has also recorded three related parasites as victimising *Leucania unipuncta*, Haw., in North America:—*Belvosia unifasciata*, Dsv.; *Phorocera leucaniæ*, Coq.; and *Winthemia 4-pustulata*, Falv. (Tech. Ser. 7, Div. Ent. U.S. Dep. Ag.)

which latter are situated above level of the oval margin; sides of face bare. Antennæ fuscous, 2nd joint rather less than ½ third, 3rd joint compressed, extremity truncated and widened, upper edge concave; arista thickened gradually, tapering to a point, basal joints well developed. Eyes with pale hairs. Proboscis black at base, suctorial portion brown. Palpi minute black, with a terminal long black hair. *Thorax* grey with four dorsal longitudinal narrow black bands, not extending to scutellum, with three post sutural macrochetæ (above base of wing) and three sternopleural ones; scutellum with four pairs of marginal macrochetæ, central ones smaller. *Abdomen* elongate, testaceous-brown; the centre of the back occupied by a broad black band that widens generally posteriorly (so as to occupy greater part of width of 4th), and, moreover, expands towards the posterior border of each segment; venter with a central black spot on each, and an additional lateral one on each side of the 4th and 5th segments; 2nd abdominal segment with two and 3rd segment with six macrochetæ on posterior border; those on 4th nearly hidden by long bristles. *Legs* testaceous-yellow, rounded spot at base, and elongated spot at extremity, and tarsi black; pulvillus of foot white. *Wings* with 1st longitudinal vein bare, 4th longitudinal reaching fore-border rather less than half-way from tip of 2nd to apex; small cross vein opposite middle of discal cell. *Tegulæ* white. Length, 12 mm.

B.—Predaceous Insects.

In addition to the true parasites of the *Leucania* caterpillars, there are other insects belonging to Beetle (*Coleoptera*), Bug (*Hemiptera*), and other families that prey upon them, and either suck out the fluid contents of their bodies or consume their tissues.

Amongst these the most conspicuous, although not the most prevalent, is a large beetle belonging to the family Carabidæ, and named *Calosoma australis*, Hope. This beetle may attain a length of an inch, and maximum breadth of half-an-inch. It is nearly black beneath, but its upper surface is of a brilliant dark-green colour, and its wing-covers are striated with numerous punctured lines. These features, as well as its general form, are represented in Fig. 1 of Plate 77.

The *Calosoma* beetle runs over the surface of the ground in quest of its prey, but its secluded habits and activity, as well as the fact of its being for the most part nocturnal, prevent its being observed as frequently as might otherwise happen. It is, however, a voracious feeder, seizing its victim in the first instance in its formidable jaws, and no doubt renders considerable service.

C.—Birds.

Allusion has already been made to the service performed by birds in limiting the numbers in which these caterpillars occur. When a visitation of caterpillar hordes is being experienced, native birds, as a rule, are not numerically sufficiently strong to accomplish very noticeable benefit. It is, however, during seasons in which these marauders do not assert their destructive capabilities that the useful work of these friends of the farmer is performed. At these times they largely contribute to maintain the numbers in which these insects occur within safe limits. Amongst them may be specially mentioned, not only such birds as Laughing Jackasses (*Dacelo gigas*), the Pied Crow Shrike (*Strepera graculina*), the Magpie (*Gymnorhina tibicen*), Butcher Birds (*Cracticus spp.*), Magpie Larks (*Grallina picata*), the Mutton Bird (*Corcorax melanorhamphus*), the Crow (*Corvus australis*), the Curlew (*Ædicnemus grallarius*), the Plover (*Lobivanellus lobabus*), but also the smaller Fly Catchers proper, not excepting even the diminutive Blue and Red-backed "Wrens" (*Malurus spp.*). There are, however, some birds that accomplish even greater work than these, and reduce the numbers of the caterpillars to a very appreciable extent when they occur in the myriads that are sometimes encountered. The Straw-necked and White Ibises are especially alluded to in this connection. These not only feed over

PLATE 75.—WHEAT: HEAD OF STOOL SHOWING INJURY BY CATERPILLAR.

the grass lands in flocks of thousands, but visit the cultivated lands, should the crops be not too high, in immense numbers also. And when the caterpillars have gone into the soil to pupate, they will even search for them with success with their long beaks, probing the earth in all directions.

D.—DISEASE.

The consideration of the subject of disease in caterpillars—caused by either bacteria or by fungus germs, and its possible propagation by artificial means—is postponed.

REMEDIES.

1. The effectual exhibition of remedial measures implies a prompt recognition of the presence of the caterpillars. As a rule they may be long present in a growing crop and yet escape observation, simply because their injuries are not sufficiently pronounced to betray their occurrence. It is, therefore, expedient that the farmer inspect from time to time his growing crop, especially early in August and February, and pull up here and there some of the ranker growing clumps or stools, and shake these well with a view to discovering the immature caterpillars—pale miniatures of the pest as ordinarily perceived. This remark is prompted by the experience, that usually it is not until the caterpillar is full-grown and has almost completed, not only the first phase of its existence, but also all the injury that it is capable of inflicting, that measures of repression are sought out.

2. Moreover, as it often happens (though the reverse may occur) that the whole area of a plot in crop is not simultaneously attacked, but different parts are visited successively, it will be found generally practicable to isolate the earlier infested portions, if narrow roads be left intersecting the area under cultivation, to contain ditches or furrows that may be ploughed or dug along them.

3. Although generally it is expedient to sow early and raise a quickly maturing crop in view of the probability that rust may assert its presence, it is expedient, having regard to the probable occurrence of caterpillars, to so arrange the time for sowing that the plants constituting the crop will not be sufficiently advanced at the time that the moths are about to afford a suitable location for their eggs. And in deciding the probability of such an occurrence it is necessary to note two things:—1st, the extent to which the caterpillars and chrysalises constituting the immediately previous infestation have been victimised by parasites; and 2nd, the degree of prevalence of the parent moths. The former may be generally inferred by the comparative numbers in which moths visit the lights in the house after nightfall; and the latter by submitting uninjured chrysalises, in earth, to the Department for examination. It must be added, however, that, though June is probably the best month to sow on the Darling Downs some cereals (*e.g.*, oats), still, owing to the dryness that generally prevails then, germination may not take place.

4. When caterpillars are early perceived in the young growth it will be often expedient to feed it off with sheep or cattle. The trampling of stock is very fatal to pests of this description, and the act of feeding on the part of cattle also destroys them, even where they are not killed by exposure and by partial deprivation of sustenance.

A similar result may be accomplished by passing a heavy roller over the land, as, having soft bodies, they are quite readily injured; but this procedure, as also the preceding, can only be successfully

PLATE 76.—*Leucania unipuncta*, Haw.

resorted to when the growth is quite short. The use of a roller, under these circumstances, will be especially serviceable when the ground is firm and smooth. The presence of a strong stubble, in the case of a second growth of green fodder having to be dealt with, will, of course, too, interfere with its use. A roller, moreover, cannot be advantageously employed at times when it would quickly become covered with adherent soil, for this would produce results somewhat similar to what would be attained were the surface naturally uneven.

5. Poisoning caterpillars in the developing wheat or barley crop, at a time when much leaf for them to consume occurs is not advised. To be efficacious then an application to the entire foliage would be necessitated. Even were it expedient in the face of other objections, we have not at present in Queensland the appliances for treating large areas, such as are the Strawsonizer and its more modern representatives. Poisoning, however, is a valuable procedure, when already much of the flag has been consumed, and the heads of grain are advanced in growth and threatened with attack. The poison then favoured is the ordinary Cut-worm Bait. This is not a fluid but a mixture composed of an arsenic salt (such as Paris Green, Arsenate of Lead, ordinary Arsenic Arsenious Acid, or Arsenite of Soda), as the essential ingredient; bran or middlings and bran in equal amounts, as the medium, and molasses or sugar for the attractant. The two first are to be mixed in the proportion of 1 lb. to 30 lb. (even up to 50 lb.), and the mixture moistened with sugar and water in the proportion of ¼ lb. to 1 gallon (or molasses 4 lb.). It is found in our practice preferable to slightly moisten the medium before adding the poison, since owing to its density it cannot well be evenly mixed with a dry medium. The mixture, again, should be not rendered wet, but moist enough for the bran, &c., whilst cohering to run through one's fingers. This bait should be broadcasted over the surface through the crop, before nightfall when the caterpillars principally feed. Injury to standing wheat, in moving in it through and through, limits the use of this procedure in its case.*

6. In many cases, as previously suggested, fields owe their visitation of caterpillars not to the fact that the moths have earlier deposited their eggs on the plants constituting the crops growing thereon that are the object of attack, but, on the other hand, to migration of caterpillars from adjacent ones. The same remark applies also to different plots in the same field. That this has been the case has been shown in many instances, in the course of this investigation. It becomes, therefore, expedient to adopt measures to protect the still unvisited cereal or grass crops. This may be effected by the adoption of one or other of the following measures:—Surround the infested area with a ditch or furrow. If the ground be loose or rubbly in accomplishing this, plough in succession two or more furrows, as deep as practicable, with a double mouldboard plough, making the sides as loose as possible by dragging brush

* Mr. L. Redwood, Toowoomba, has laid stress on the efficacy of the Poison Bait when barley is being attacked and it has reached the stage of growth when it is turning a golden yellow, the flag is down, and the heads are about to be cut off by the caterpillars, now very hungry. He uses as a mixture:—1 bushel of wheat bran, 1 lb. arsenic, or its equivalent of Paris Green, sweetening with sugar syrup (preferable to molasses), until the taste of the poison is masked. He also advocates adding a green analine dye to the sweetening fluid when Paris Green is not used. He lays great stress on thorough mixing. He does this first when the ingredients are dry, using a shovel and mixing floor; then with further mixing, adds the sweetening with a sprayer or watering-can, until the necessary moist condition is reached. This bait should be preferably made in the morning and used late in the afternoon; the poison thoroughly impregnating it meanwhile. A bait so made and employed he has found quite deadly to the caterpillars and serving to enable a harvest to be secured that would otherwise be sacrificed.]

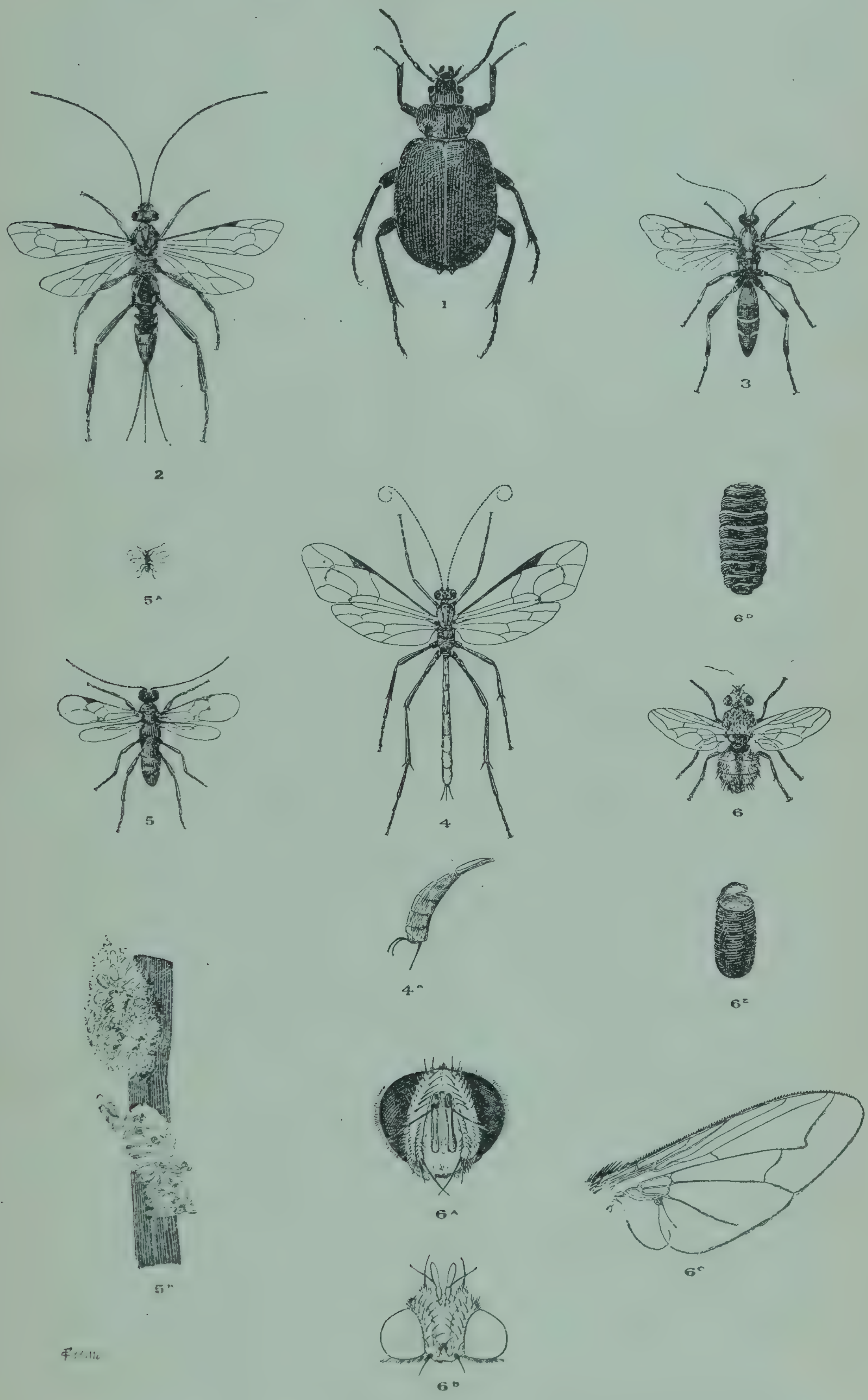

Plate 77.—Natural Enemies of *Leucania Unipuncta*, Haw

along it. Moreover, should coal tar or gas lime be sprinkled along one of these, a still more effectual barrier will be secured. When the soil is, on the other hand, not loose, but sufficiently firm to allow of one side of the furrow remaining perpendicular or even overhanging, a standing crop, under the circumstances alluded to, may be protected by constructing a special form of ditch such as is described in the following quotation:—"The worms [writes the late Dr. C. V. Riley] may be prevented, as a general thing, from passing from one field to another by judicious ditching. It is important, however, that the ditch should be made so that the side towards the field to be protected be dug under. About every three or four rods a deep hole in the ditch should be made, in which the worms will collect, so that they can be killed by covering them with earth and pressing it down. They may also be destroyed by burning straw over them—the fire not only killing the worms but rendering the ditch friable and more efficient in preventing their ascent" (*Report Commissioner of Agriculture*, U.S.A., 1882, page 96). The holes in the ditches alluded to trap the caterpillars as they wend their way along the bottom of the ditch in their effort to pursue their onward march to pastures new; and when in these an ordinary rammer will despatch them.

Experiments on my part have shown that the caterpillar will not eat fodder that has been moistened with a comparatively weak solution of either iron sulphate or copper sulphate (bluestone), even after such fodder has been subsequently dried off; or, if it does so—as may happen when the former of these reagents has been used—only sparingly so, and with apparent reluctance. It may, therefore, prove advantageous, by way of protecting plant growth, to spray it with one or other of these solutions. The necessity for protecting young maize plants from caterpillars travelling from an adjacent field of wheat, oats, or other cereal seems to afford an instance in which this procedure might be not only practicable but also successful. However, the possible injury to the plant from the use of too strong solutions must be anticipated.

Again, with a like object in view it will often be found profitable to poison a broad strip of herbage immediately in advance of a travelling host of caterpillars. Paris Green or London Purple may be used for this purpose. [If the former be employed, that bearing the brand of Messrs. Blundell and Spence, and sold in 1-lb. packets, is recommended in preference to other forms of the article on the market, as having a composition fairly uniform.] These poisons may be exhibited either in water or with some dry diluent as a powder. In the former case 1 lb. of Paris Green or $\frac{3}{4}$-lb. of London Purple, having been first made into a paste, should be mixed with 150 gallons of soapy water to which a like weight of fine lime has been previously added (*i.e.*, at the rate of 1 teaspoonful Paris Green to $1\frac{1}{2}$ gallons water), and the whole wash be kept well stirred whilst being applied. In the latter case it may be mixed with flour, or plaster of Paris, 1 lb. of Paris Green being mixed with 40 to 50 lb. of the former, or 100 lb. of the latter. (*Note.*—Since this was written Arsenate of Lead and Arsenate of Lime have, for most insecticidal purposes, superseded Paris Green and London Purple. In employing the former use the paste in the proportion of 1 lb. to 10 gallons of water, or as a dry application mix the Arsenate of Lead powder, with wood ashes, road dust, cheap flour, or powdered lime.) These poisons, if used dry, should be dusted over the plants, having been first placed in a bag, made of some pervious material that is to be fastened to a pole (two such bags, one at each end of a pole, may be placed across a horse's back, and the animal led over the ground it is

proposed to poison, when the jerking will liberate the poisonous dust). If applied in the form of a wash, the mixture may be distributed by means of a watering cart, or Strawsonizer, or other similar apparatus. When the strip of poisoned fodder has served its purpose, it should be mowed down and burnt, to prevent its being consumed by stock prior to its being rendered innocuous by exposure to successive showers of rain.

7. The fact that the insect hibernates as a caterpillar, and frequently may exist in the egg condition in dry grass and stubble, and, moreover, habitually frequents rank herbage, suggests the expediency not only of maintaining the headlands of fields clean and free from weeds, but also of periodically firing pastures. This should be done even when visitations of caterpillars are not immediately impending, as the insect always exists in these situations in greater or less number, and will, under favouring climatic conditions, the existence of a paucity in the numbers in which its natural enemies occur, or the lessened effectiveness of natural checks, generally multiply to a highly prejudicial extent.

8. Under certain special circumstances the moth may be captured by trap-lanterns, or killed by attractive poisoned sweets. The conditions under which crops are grown in Queensland are, however, such that their use is not likely to be attended with any marked result.

9. The fact of domestic poultry being very partial to insects, and caterpillars especially, might be utilised in repressing these in ordinary seasons; the difficulty that is experienced in getting certain varieties to roam far from their roosts being overcome by the use of transportable fowl-houses, as recommended in the writer's Report on the Grub Pest of Sugar-cane: these houses to be moved over the standing crop when this is but little grown and the caterpillars are still young.

10. Farmers interested in caterpillar repression should make it their business to strenuously oppose the destruction of all insectivorous birds and their eggs; especial allusion being made to such birds as are hereafter mentioned.

Description of Plates.

Plate 75.

Head of Stool of Wheat, as injured by *Leucania* Caterpillars. From photograph by C. J. Wills.

Plate 76.

Fig. 1. *Leucania unipuncta* Moth. Natural size. 1 *a*, portion of antenna of male; 1 *b*, portion of antenna of female. (Magnified representations.)
„ 2. *Leucania unipuncta* Moth. Position of rest.
„ 3. Chrysalis.
„ 4. Caterpillar. Dorsal and lateral views.

(From Drawings by C. J. Wills.)

Plate 77.

Fig. 1. Predaceous Beetle—*Calosoma australis*, Hope.
„ 2. Red Ichneumon—*Theronia rufipes*, n. sp. Female.
„ 3. Banded Ichneumon—*Exephanes leucaniæ*, n. sp. Male.
„ 4. Tawny Ichneumon—*Paniscus* (*productus*, Brullé?). Female.
„ 5. Social Ichneumon—*Apanteles ruficrus*, Haliday (enlarged representation). 5 *a*, Natural size; 5 b, Pupa cocoons.
„ 6. Tachina Fly-parasite—*Linnæmyia nigripalpus*, n. sp. 6 *a* and 6 *b*, Face (magnified representation); 6 *c*, Wing (enlarged representation); 6 *d*, Larva (white in nature); 6*e*, Cocoon from which fly has emerged.

(From Drawings by C. J. Wills.)

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1921.	Sept., 1920.
North Coast.	In.		In.	In.
Atherton	0·58	20	1·58	0·21
Cairns	1·67	39	3·85	1·03
Cardwell	1·45	49	3·09	2·52
Cooktown	0·58	45	0·95	0·91
Herberton	0·47	34	0·89	0·23
Ingham	1·14	29	5·19	2·99
Innisfail	3·56	40	8·80	2·49
Mossman	1·13	13	2·37	2·04
Townsville	0·78	50	1·76	1·89
Central Coast.				
Ayr	1·57	34	1·32	0·91
Bowen	0·84	50	1·07	1·07
Charters Towers ...	0·80	39	1·31	0·66
Mackay	1·49	50	9·07	1·20
Proserpine	2·00	18	9·44	2·93
St. Lawrence ...	1·33	50	2·26	0·93
South Coast.				
Biggenden	1·72	22	2·22	2·61
Bundaberg	1·84	38	0·35	1·94
Brisbane	2·08	69	2·02	3·43
Childers	2·03	26	1·34	3·21
Crohamhurst ...	2·53	25	5·28	3·71
Esk	2·35	34	1·66	3·24
Gayndah	1·60	50	0·87	2·67
Gympie	2·16	51	3·17	2·82
Glasshouse M'tains	2·08	13	...	2·77
Kilkivan	1·74	42	1·77	1·86
Maryborough ...	1·97	50	2·49	2·52
South Coast—continued:	In.		In.	In.
Nambour	2·48	25	3·71	2·57
Nanango	1·96	39	1·66	2·47
Rockhampton ...	1·31	34	2·08	0·66
Woodford	2·15	34	4·32	2·48
Darling Downs.				
Dalby	1·80	51	1·25	2·34
Emu Vale	1·90	25	2·82	2·06
Jimbour	1·66	33	0·63	1·65
Miles	1·49	36	1·22	2·67
Stanthorpe ...	2·47	48	2·77	2·99
Toowoomba ...	2·24	49	3·04	2·40
Warwick	1·92	34	1·84	2·29
Maranoa.				
Roma	1·61	47	0·64	2·64
State Farms, &c.				
Bungeworgorai ...	1·58	7	0·58	1·75
Gatton College ...	1·76	22	1·85	2·54
Gindie	0·90	22	4·64	1·32
Hermitage ...	1·68	15	2·28	2·51
Kairi	0·79	7	...	0·24
Sugar Experiment Station, Mackay	1·33	24	...	1·20
Warren	0·75	7	1·40	0·40

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1920, having been compiled from telegraphic reports are subject to revision.

GEORGE E. BOND, State Meteorologist.

ARSENICAL POISONING.

By A. H. CORY, M.R.C.V.S.

The medicinal treatment for arsenical poisoning should be prompt and thorough. In small animals, such as dogs and cats, an emetic is advisable, such as salt and mustard in about 3 oz. of warm water. With horses and cattle, medicine must be given, which forms an insoluble compound with the arsenic.

The following treatment is recommended:—Take about 2 oz. of ordinary washing soda, and dissolve it in about half a pint of water, then add 2 oz. liquor ferri perchlor; a sediment forms, and it is then strained through a piece of fine linen and the sediment collected and mixed in 1 pint of cold water and given as a drench, being repeated every half-hour for at least five or six doses.

Editorial Notes.

Primary Principles of Co-operation.

In this issue the Director of Fruit Culture, Mr. A. H. Benson, discusses some problems of produce disposal for which a solution is being sought by the fruitgrowers of this State, and, incidentally, enters a strong plea for the broadening of co-operative effort by primary producers generally. The development of co-operation is evidence that the farmer is gradually readjusting his point of view to bring within focus the effects modern social and economic changes are having upon his industry, and necessity is compelling him to affiliate with his fellow farmers in order to secure fair returns for his labour and enterprise. The pinch of hard times and market problems, the futility of fighting single-handed trade combinations both on the buying and selling sides, transport difficulties, and excessive operation costs, are the main forcing factors in a general forward move towards wider and intelligent co-operation. The pressure of need is one of the primary principles of joint action. Another is combination on a broad, constructive, sound, economic basis. The first is axiomatic and, in respect to the second, experience teaches that often, in the establishment of co-operative enterprises, business principles are to some extent ignored. The rocky road of rural progress is strewn with the wrecks of associations that were conceived with high hope and started out freighted with lofty purpose and impractical enthusiasm. In any further extension of co-operative enterprise the lessons of the past should be our guide. The sound business way is the only way. No new commercial venture can expect to escape the fierce competition of existing enterprises, directed by keen brains, with which it will inevitably be beset. Brains must be met with brains, and no co-operative concern can expect a full measure of success unless based on modern business principles and economically conducted. These observations, which are almost in the nature of a warning, may be thought unnecessary. In view of a general awakening to the value of combined action by primary producers, they possibly are, for on all sides are signs of the recognition of science and experience as valuable auxiliaries in bringing about better farming, better business methods, and a richer rural life.

General Notes.

PUBLICATIONS RECEIVED.

The Veterinary News (13-8-21) has a very interesting editorial on tuberculosis in cattle and its relation to public health, in the course of which it states: ''If the veterinary profession were to inform the public that tuberculosis in cattle was a great danger to human health; that a large percentage of deaths, joint diseases, meningitis, glandular enlargements, tabes mesenterica, &c., were caused by the consumption of milk of tubercular cows; that the care taken in the pasteurisation of milk was not always such that would guarantee the milk being germ-free; that cattle, found to be *tubercular by the tuberculin test were being sold and scattered all over the country* (*U.K.*), *more especially by pedigree breeders*; and that cattle and swine were of more importance than human life or health: it would be doing its duty and earning *kudos*. It is said that the country could not afford to stamp out the disease, but the best veterinary experts have informed us that this is not so. It could be stamped out much more cheaply than the costs of erection of expensive plant for the pasteurisation of milk. . . . When tuberculosis endangers the health of the community and takes a high toll of young life, it cannot afford to spend any money in attacking the disease at its root. . . . The country (U.K.) pays more attention to the prevention of diseases of the potato than it does to the prevention of tuberculosis in cattle, and, in consequence, in man. . . . There are a few ultra-selfish dairy farmers and pedigree breeders who, in order to benefit themselves, spread the disease elsewhere without diminishing its total incidence one jot. Tuberculosis should be prevented or eliminated first by eradicating the disease from cattle. That is the paramount duty of the veterinary profession. As to its suppression in man, that becomes the responsibility of the medical profession.''

Answers to Correspondents.

DAIRY STOCK.

P. J. HULL (Kaiyera, Cardwell)—

(1.) Using milk for a calf from a cow of another breed will not affect the purity of the calf's breeding in any way. It is possible, however, to seriously mar the dairy quality of any calf bred for production (dairy purposes) by rearing it solely on a plentiful supply of whole milk. In other words, a calf of a dairy breed can be reared *too well*, and in this way encouraged to lay on flesh and fat. Jersey calves, for example, fed solely on an excess of whole milk up to weaning age, say seven or eight months, would have a tendency to alter in type and to become gross, particularly if run on rich pastures. Some of this grossness may be overcome later on by breeding from them younger than is usual, say at the age of fifteen months.

(2.) Quantity of whole milk required daily for a calf—One gallon constitutes an ample ration, even for a well-grown calf, a younger animal requiring slightly less. It is not known whether you purpose continuing to rear the Jersey calves on other cows, but, if the latter are fairly good milkers, one cow should rear two calves.

(3.) The practice of thoroughly quietening the calves by tying them up at night, using a strap round the neck, and a length of chain with a swivel on it, will do much to keep them quiet and tractable. This system is certainly to be preferred to allowing the calf to run at large with a foster-mother.

(4.) Your pure-bred Jersey bull may be used for all classes of healthy animals, without detriment to the purebreds.

(5.) We have no special pamphlets on the subject of the feeding of dairy cows and calves, other than the pamphlet on feeding whey, which is being forwarded to you. This is merely sent for reference purposes, as it is known you are not cheesemaking.

(6.) Details of certain rations for dairy cows are being forwarded. These may not be exactly applicable to your case, but will serve as a guide as to the quantities of respective foods required when an animal has to depend solely on foods supplied.

ENTERITIS—A POULTRY DISEASE.

H.L. (Reid's Creek, Gayndah)—The Poultry Expert, Mr. J. Beard, advises as follows:—

"Now that the hot weather is again with us it would be wise for all poultry-keepers to be on the alert and avoid, if possible, the introduction of this serious disease. *Causes.*—Stimulating foods, over-feeding, irritating vegetable and mineral poisons, drastic purgatives, unclean water, the presence of unslacked lime, continuous feeding of house scraps or sloppy foods which have a tendency to become sour and contaminated. The disease, when due to any or several of the foregoing causes, is generally confined to individual birds, but if it becomes contagious it spreads rapidly through the flock. Heavy mortality is a consequence. *Symptoms.*—Listlessness, closure of eyes, ruffled plumage, continual trembling, restlessness, shanks lose lustre and shrivel, bilious-looking excreta. *Treatment.*—Quarantine affected birds in a clean warm coop, administer two teaspoonfuls of castor oil to each; two hours later give to each ten drops of chlorodyne on a piece of bread. Should the excreta not harden in from six to eight hours, give another five drops of chlorodyne in the same way, and continue until a cure is effected. Feed on soft food such as bread and milk or boiled rice. Treatment should be commenced as soon as symptoms are noticed. Houses and runs must be thoroughly cleaned and disinfected. All rubbish and dirt should be burnt. Remove droppings every day and burn them, as they contain germs of the disease. *Prevention.*—Cut a kerosene tin in half, end up, place therein clean drinking water to which has been added one tablespoonful of kerosene. The oil spreads over the surface, and the birds get a little every time they drink. This practice should be carried out every third day during a threatened attack. All other water should be kept out of reach. This is also a certain cure in case of slight colds or roup of any kind, providing the gills and nostrils are washed out and dried."

Farm and Garden Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasselling period harmonising later on with the summer rains, December planting may be carried out in districts were early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resistant. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum when in head, in the proportion of one-third of the former to two-thirds of the latter, a well balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary, otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton sown in October and November will be making great headway, owing to the September and October rains. Keep down all weed growth by scarifying as long as the growth will admit of horse work. Tree cottons, such as Sea Island and Caravonica, should be topped and pruned.

KITCHEN GARDEN.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown. All vacant ground should be well manured and dug two spits deep. Manure and dig as the crops come off, and the land will be ready for use after the first shower.

Flower Garden.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface, beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulaca, zinnia and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

Orchard Notes for December.

THE COAST DISTRICTS.

The planting of pineapples and bananas can be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple-growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borers should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as

possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codling moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste. It is better to get a good price for half the crop and destroy the balance than to rush the whole on to the market and get little or nothing for it.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codling moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gall. of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain take place. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

CAPE WEED.

LACKEY AND SONS (Summit)—Your letter and the specimen forwarded were referred to the Government Botanist, Mr. C. T. White, who advises as follows:—

> "The specimen forwarded is the Cape Weed (*Cryptostemma Calendulacea*), a native of South Africa and a naturalised weed in practically all the Australian States. It is much more abundant in New South Wales and Victoria than in Queensland, and in those States is regarded as a most aggressive and noxious weed. It has, however, a certain food value for stock, though when it dies down it presents a somewhat woolly mass, and may cause impaction in animals feeding on it."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	September.		October.		November.		December.	
Date.	Rises.	Sets.	Rises	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5·51	4·53	6·10	4·46	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6·13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5·40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5·6	5·59	4·47	6·22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H. M.
2 Sept.	●	New Moon	1 33 p.m.
9 ,,	(	First Quarter	1 30 p.m.
17 ,,	○	Full Moon	5 20 p.m.
25 ,,	)	Last Quarter	7 18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10 26 p.m.
9 ,,	(	First Quarter	6 12 a.m.
17 ,,	○	Full Moon	9 0 a.m.
24 ,,	)	Last Quarter	2 32 p.m.
31 ,,	●	New Moon	9 39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	(	First Quarter	1 54 a.m.
15 ,,	○	Full Moon	11 39 p.m.
22 ,,	)	Last Quarter	9 41 p.m.
29 ,,	●	New Moon	11 26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	(	First Quarter	11 20 p.m.
15 ,,	○	Full Moon	12 50 p.m.
22 ,,	)	Last Quarter	5 54 a.m.
29 ,,	●	New Moon	3 39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Agriculture.

SEEDS AND WEEDS.

BY F. F. COLEMAN, Expert under the Pure Seeds Acts.

"In general, those weeds are most numerous which rise from seeds, and those most difficult to be extirpated which come from roots."—Thomas Hale, "The Compleat Body of Husbandry, 1756."

A seed may be described as a ripe ovule containing an embryo plant. The embryo is the essential part of the seed; the other structures are subsidiary to its nurture, protection, and germination.

Seeds are usually able to remain for months, or even years, in a dormant state, hardly distinguishable from death, except in their power of reawakening.

They may not be ripe on separation from the parent plant, and ripeness is not always coincident with readiness to germinate. In cereals it will be frequently noticed that during a wet harvest some grain germinates in the seed head; others may undergo a form of incipient germination which prevents or retards subsequent growth. Generally speaking, seeds are not ready to germinate until they have passed through a stage of apparent dormancy, during which period the enzymes or unorganised ferments contained in the seeds have time to do their work by preparing the reserve food material.

If Mauritius beans or Lucerne seed be dropped into water, and left to soak for a few hours, it will be noticed that some of them remain the same size and shape as when put in water. These are called "hard seeds," their seed coats being so impervious to water as to delay germination. It has often been stated that the thickness of the hard layer of the testa prevents the seed absorbing water; this, however, may be due to the amount of ash ingredients that the coat contains.

Seeds vary greatly in their powers of retaining life, some of the Leguminosæ, in particular those containing a large amount of hard seeds, are capable of germinating after several decades. Unfortunately, carelessly made experiments have given rise to many exaggerated statements as to the powers of vitality that seeds possess.

Subtropical and tropical climates are usually associated with high temperatures and excessive moisture, which gives rise to conditions causing rapid deterioration.

The principal factor covering the keeping of seeds in good condition is a low moisture content, and storage at a non-varying low temperature.

No matter under what conditions a crop may be grown, the resulting seed will contain impurities. If reasonable care has been given to the crop, up-to-date seed-cleaning machinery will easily remove any foreign ingredients that the seed may contain. The best of machinery, however, cannot make dead and non-germinable seeds grow, but the differences in the specific gravity enable many immature and light seeds to be taken out; at the same time, the sieves will separate the foreign seeds, be they weed seeds or seeds of a cultivated plant other than the kind that the crop represents.

Seed-cleaning machinery cannot make bad seeds good, but it does make good seeds better.

Given favourable conditions at the time of sowing, the farmer may find that his crop contains a considerable number of plants other than the kind that he wishes to grow, or he may find his seed has failed to make a stand, and his season and labour have been wasted. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the purity and germination of any seed that he has purchased before sowing it.

The best is the cheapest, whatever the price, and quality should be the one and only consideration. In order to form an opinion as to the quality of any seed, careful examination should be made of a sample drawn from the actual bulk. The purchaser should ascertain the maximum amount of—

(1) Dead and non-germinable seeds.

(2) Inert matter.

(3) Weed or other foreign seeds.

If the seller has a full knowledge of the article that he is offering, he can at once furnish this information, which can only be based on an examination of a large sample drawn from the bulk in his actual possession. In the same manner the buyer can only obtain accurate information as to the quality of the seed that he has purchased by the examination of a large sample, taken from the seed delivered and now in his possession. No reliance should be placed on the appearance of any sample drawn in any other way.

Unfortunately, the majority of both buyers and sellers cannot identify even the weed seeds of most common occurrence. These vary so much in size that a statement of the percentage present conveys no real idea of the number in one pound. One per cent. by weight means that the farmer sows with every pound of seed one-hundredth of a pound of weed seeds. Darnel and Oriental rocket are frequent impurities in Oats, and the approximate number of seeds contained in 1 per cent. would be 390 seeds of Darnel (*Lolium temulentum*), and 17,900 seeds of Oriental rocket (*Sisymbrium orientale*). Many samples of Oats contain 2 per cent. of Darnel; this means the sowing of 780,000 Darnel seeds with every 100 lb. of Oats.

Seeds constitute the most variable material that the farmer purchases, and weight for weight the most costly of his purchases. As the success or failure of a crop, or even succeeding crops, may be determined by the kind or condition of the seed sown, the importance of accurate knowledge of the article is essential.

An opinion as to the quality or condition of any seed should only be based on actual facts, revealed by an analysis conducted under uniform scientific conditions. This work is undertaken by the Pure Seeds and Stock Foods Branch of the Department of Agriculture. A leaflet giving information as to size of samples and other particulars can be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

By H. I. JENSEN, D.Sc. (SYD.).

(Continued from November "Journal.")

An area of country containing representatives of all the same soil types as the stretch between Roma and Injune was investigated by the writer in the north-east of the Pilliga Scrub, in New South Wales. A comparison of the soil analyses was

made for that area, which will, no doubt, be found to hold also in the area under review. It is given below:—

Characteristic Timber.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
Pine	0·50	2·23	·025	·049	·046	·076
Stringybark	0·71	2·81	·031	·060	·034	·062
Narrow-leaf Ironbark ..	0·65	2·12	·033	·089	·040	·064
Box Buddah (Sandalwood)	2·25	4·98	·089	·257	·129	·111
Poplar Box	2·40	5·54	·081	·281	·115	·152
Silverleaf	2·21	6·71	·098	·316	·125	·228
Belah-Brigalow Gilgai ..	5·39	6·42	·070	·568	·194	·118

The first three—pine, stringybark, and narrow-leaf ironbark (*E. siderophloia*)—are characteristic of the silicious sandstone belts and indicate typically poor soils. The others are fair to rich soils and occur on shales and calcareous sandstones.

The heavy blacksoil plain, brigalow country, and brigalow-belar country occur on the cretaceous rocks north of Roma and Mitchell, and also in strips or belts in the Walloon series along the Injune line north of Minka, and along the Durham Downs road. In the Walloon series there are narrow brigalow belts in the Upper Walloon, as near Yingerbay, a large belt in the Middle Walloon, north of Orallo, and a very much greater belt in the Lower Walloon, along the Injune Valley, Myall Downs, and Durham Downs.

Excellent belah belts are met with between Orallo and the Dividing Range, and also along Injune Creek in the soldiers' settlement area.

The sandstones represented are mostly of the calcareous variety, yielding good soils. Poor soils are confined to a few narrow strips of pine country—one situated in the top of the Walloon, near the cretaceous border, another near Orallo, and some rough sandstone mountains at the head of Injune Creek.

So closely do the timbers and soils correspond with geological formations, that if a detail geological map could be prepared showing not only the main divisions of the Walloon series, but also the horizons, that map would be at the same time a geological map, a soil map, and a forestry map.

Having treated fairly lengthily of the soils between Roma and Injune, we can now discuss the soils of the other regions more cursorily, the principles having been explained.

THE MARANOA VALLEY.

Travelling up the Maranoa Valley from Mitchell, we meet with the same formations as between Roma and Injune, but there are two other formations well represented. One of these is the cretaceo-tertiary desert sandstone. This is, in the Mitchell region, a very silicious sandstone, and has very poor sandy soils, often coarse sand, with a barren country vegetation, including lancewood scrubs (*Acacia doratoxylon*), and open forest with yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus termifolius*), woolly oak (*Casuarina inophloia*), rusty gum or sugar gum (*Angophora lanceolata*), Moreton Bay ash (*Eucalyptus tesselaris*), crooked gum (*E. dealbata*), pine (*Callitris glauca*), also the other poor country timbers already mentioned, and spinifex grass. This is pretty useless country, and is greatly in evidence about 15 miles north of Mitchell, as well as near Mitchell and Amby.

North of this, at Donnybrook and Forest Vale, we meet with good soils mostly, as between Roma and Injune, on Donnybrook and Forest Vale, giving brigalow, belah, sandalwood, box, and ironbark belts, with the same characters as those already described. North of Forest Vale and north-east at Toolumbilla and Womblebank we have the lower or calcareous Walloon belt with brigalow and belah scrubs. A beautiful belah scrub extends over a great area between Timor and Merivale, in the Dividing Range, corresponding with the belah scrubs on Injune Creek (the 56-mile) and Durham Downs.

Along the river itself are great apple-tree flats (*Angophora intermedia*), with beautiful rich sandy loams which could be made very productive by irrigation.

North of the Walloon area we get the Bundamba sandstones, which extend over most of Merivale, Crystal Brook, Eddystone Vale, Mount Moffatt, and Warrong. The soils are poor and sandy. The better flats are typical box (*E. populifolia*) country, but the rougher sandstone hills and ranges form pine country, Moreton Bay ash, sugar-gum country, and some silverleaf country answering to the description of country which these timbers have been shown to cling to.

It is fair grazing country as long as the cattle have plenty of room to "poke about," but would be very wretched if divided into small areas. It might, with

transport facilities, develop into very fair fruit and vineyard country, especially where the sandstones are felspathic, but it is, generally speaking, unsuited for farming. This poor belt is, approximately, 30 miles wide.

North of the Bundamba sandstone in the Main Dividing Range we get fairly large areas of fine basalt country on the northern portions of Mount Moffatt, Warrong, and Marlong Stations. This is first-class country, and would be as suited for cultivation as it is for grazing. Rich chocolate soils, merging into black on the flats, characterise the basalt. Coolibah, gumtop-box, and silverleaf ironbark are the main timbers. The basalt alluvials would make fine lucerne-growing areas, and the higher grounds would grow cherries and other fruits. The climate both of the Bundamba sandstone and basalt belts is that of high tableland country. The elevation is from 2,000 to 3,000 ft. above sea-level, and Stanthorpe fruits should thrive. The rainfall is much in excess of that of the plains country.

THE HEAD WATERS OF THE WARREGO.

From Killarney to Babbiloora, through the Boggarella district, we have formations, soils, and forest flora similar to those of the Walloon belts in the Orallo to Injune Creek districts, but the climate is more typical of the interior. From Babbiloora to Carnarvon Station we have the Bundamba sandstones, with their characteristic vegetation and sandy soils, already described in dealing with the Maranoa, and in the range at Carnarvon Station we have basalt country similar to that referred to in dealing with Marlong and Mount Moffatt.

The basaltic plains country at the head of the Warrego (Channing and Dooloogerah Creeks) is some of the most beautiful country in the State, and with railway facilities would be equally suitable for dairying and general farming. Its greatest defect is a remediable one—viz., the abundance of the beautiful, yet very harmful, tree zamia (*Macrozamia Moorei*). The prickly-pear has not yet reached this fine country, but is advancing in this direction, and will soon get a footing, unless checked.

THE TRIBUTARIES OF THE NOGOA.

The writer traversed down Buckland Creek to Nardoo and then across to the Nogoa at Nandowrie Peak, along the Nogoa to Vandyke Creek, up Vandyke, Coonah, and Freitag Creeks, and through the Springsure district.

Many geological formations exist in this region; hence the soils are varied. The run-off of the rainfall is very rapid, the country falling from 3,000 ft. above sea-level to 600 or 700 ft. above sea-level in from 10 to 30 miles. The streams are veritable canyons at the head, with high barren sandstone and basalt escarpments on either side.

Naturally, swift running streams deposit a great bulk of their sediments when the grade of the stream becomes less, hence the lower reaches of these streams are flanked by rather wide belts of alluvial, which, containing detritus from limestone, basalt, sandstone, shale, and other rocks, are exceedingly well-balanced and fertile soils.

In other respects the Nogoa tributaries are characterised by the same soils and vegetation that are usually found on the same classes of rocks in other parts already described, and only brief notes are essential. High up in the mountains we have basalt ranges and tablelands. The soils derived from the basalts are good; but the ranges are rough, the run-off of rainfall is rapid, and springs are very few. However, at the base of the basalt ranges springs are particularly abundant and of a permanent nature. The basalt country is mostly too rough and dry for agriculture, and too rough for grazing. The access to the tablelands is so steep that cattle seldom wander up, in spite of the rich carpets of mountain grass growing on them. The pastoralists are not anxious, either, to have their cattle in this region, since the zamia grows so thickly on the basalt ranges that most of the cattle feeding here get the rickets. The timbers on the basalts are mostly box (*E. hemiphloia*) and silverleaf ironbark (*E. melanophloia*).

Below the basalts we have the "Upper Bowen" sandstones. They occupy a belt of country bounding the Carnarvon Range basalts on the north. The soil is poor silicious sandy loam, which is very inferior pastoral country, except where basaltic detritus is intermixed through alluviation. The timbers in this region comprise spotted gum (*E. maculata*), crooked gum (*E. dealbata*), Moreton Bay ash (*E. tesselaris*), sugar gum (*Angophora lanceolata*), ironbark (*E. decorticans*), pine (*Callitris glauca*), yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus*), stringybark (*E. acmenioides*), oak (*Casuarina inophloia*), dogwood (*Jacksonia scoparia*), cherry (*Exocarpus cupressiformis*), with a variety of wattles, among which *Acacia Bancrofti, A. doratoxylon, A. Cunninghamii* are very plentiful. The next belt met with to the north is the coal measures and limestones of the "Upper Bowen" formation. The soils of these coal measures are variable, inasmuch as we have strata of silicious rock and shale alternating with calcareous sandstone and shale, but on the

average this belt is good pastoral and agricultural country. The heavier calcareous belts of soil have typical calciphile vegetation—namely, brigalow scrubs with belar, wilga, and other calciphile trees. Some of the limestones of the "Upper Bowen" formation are covered with blacksoil plains devoid of timber, open plain type. These are richly clad with nardoo, saltbush herbage, and fine fodder grasses. Plains of this kind are seen at Nardoo Station, east of Mount Sunday, in the Blue Hills region, on Vandyke Creek and Spring Creek, near Mount Sterculius, on Wealwandangie Head Station, and elsewhere. With irrigation these black soils grow magnificent vegetables, as was instanced by the station garden at Wealwandangie. The Bowen limestones and calcareous shale soils contain much free "copi" (gypsum) which is the best neutraliser of excess of alkali. Hence the alkali trouble which is so great on irrigated lime soils in our western interior is not felt here; the rainfall and removal of alkali by leaching are also greater. The "Upper Bowen" coal measure and limestone belt in this area is consequently a fine belt of agricultural land, probably second to none in Queensland. The "Middle Bowen" formations, which form the next belt to the north, are composed mainly of sandstone and conglomeratic sandstone, with a coal measure belt intercalated. The coal measure portion is fair land, but contains little pure limestones. It is not noted for open plains or brigalow scrubs, but the coal measures have abundant bloodwood (*E. terminalis*), silverleaf ironbark (*E. melanophloia*), box (*E. populifolia*), and timbers like those of the Walloon coal measures north of Roma. The soils are good in all mineral plant food constituents.

Now, the conglomeratic sandstones of the "Middle Bowen" formation in this area and in other areas to be mentioned later are very much better in soil and stock feed than the sandstones of the Bundamba and Upper Bowen formations. There is much detritus derived from granite, slate, porphyry, and even of limestone in the sandstones of this belt. The soils, though mechanically gravelly sandstone soils, are richer in plant food than most other soils derived from similar massive sandstones. This belt is, therefore, fairly well suited for small stations and large grazing farms. The timbers of this belt include, conspicuously, spotted gum (*E. maculata*), yellow jacket (*E. Watsoniana*), pine (*Callitris robusta*), river red gum (*E. rostrata*), Moreton Bay ash (*E. tesselaris*), cabbage gum (*E. papuana*), and bloodwood (*E. terminalis*). The alluvial soils throughout the Nogoa quadrant are splendid. The characteristic timber is coolibah (*E. microtheca*).

THE TRIBUTARIES OF THE BROWN RIVER.

It suffices to state that the soils met with and the timbers they support are identical with those of the Nogoa, except that, in regard to timbers, several timbers of a coastal type creep in and mingle with the western timbers on the Brown River basin. That mingling of inland and coastal floras, which is first well marked in the vicinity of Rolleston, becomes very strongly marked in the country between the Expedition Range and Taroom. At the head of the tributaries of the Brown River we also meet with the calcareous shales of the "Ipswich" coal measures, with beautiful black and chocolate soils of a heavy nature, clad with brigalow, belah, wilga scrub, and the Ipswich formation sandstone, a yellow sandstone, rich in felspathic detritus, hence good in potash, on which we have open forest with box species (*E. populifolia, E. cambageana, E. hemiphloia*), ironbark (*E. melanophloia* and *E. crebra*), zamia, &c. The belar and brigalow scrubs on the black soils of Ipswich formation in this area are the specially favoured habitat of the prickly-pear, all varieties.

The coal measure belt of the "Upper Bowen" in the Brown River basin occupies comparatively low ground—usually only 600 to 800 ft. above sea-level; hence much of it is alluviated with wide stretches of magnificent alluvial soil of mixed origin, reaching usually a thickness or depth of 40 to 50 ft. The alluvials along Consuelo Creek, Carnarvon Creek, Arcadia Creek, the Brown River, and Moolayamber Creek, in this belt, are superior to anything I have seen elsewhere. They form coolibah and ironbark country. The silverleaf ironbark, which south of the Carnarvon Range favours stony ground with shallow soil, becomes in this region a denizen particularly of deep alluvial soils. This, of course, depends absolutely on the fact that silverleaf ironbark must have a sufficiently calcareous soil and good drainage to live. It can always be taken to indicate those soil properties. A limestone soil apt to get waterlogged does not suit it any better than a soil devoid of lime.

The soils of the "Upper Bowen" coal measures and limestones in the Brown River basin are very saline in nature. Saltbush, marsh, couch grasses, and other grasses which like a saline environment, predominate. The prickly-pear is spreading fast. The pear is in itself an indication of salinity, so much so that I am seriously considering the rate of the spread of prickly-pear a gauge of salt content in a formation, and hence a means of locating likely oil country.

The saline plains of Warrinilla would be fine dairy country if subdivided. Unfortunately, the pear is here spreading fast.

(TO BE CONTINUED.)

Pastoral.

PRINCIPLES OF STOCKFEEDING—I.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College, Gatton.

[The first of a series of papers setting out, as simply and practically as possible, some of the main principles of stockfeeding. Mr. Potts does not propose to delve deeply into the science of feeding, and his object is, rather, to use the results of scientific investigation in an effort to show how stockfeeding may be made more profitable.—ED.]

For us in Australia the study of the principles underlying the proper feeding of stock is more important than for those living in older countries which have years and years of stockfeeding experience to draw on. In many of these older countries, with their well-established rotations of crops—for example, the North of England and Scotland—long experience has taught men how to feed stock well merely by the process of trial and error. Now, in such countries a boy brought up on a farm learns how to feed stock without knowing why. He learns by imitating his elders. Even so, the study of the scientific principles underlying stockfeeding has been of advantage to these countries of long practical experience. How much greater must the advantage of this study be to us who have no such practical experience of generations to draw on, to us in Australia who really do not know how to feed stock?

Before proceeding to a description of what a feed consists of, let me try to give a quick example, illustrating that there is more in feeding than just filling an animal's stomach. Probably most of you in front of me are thinking or muttering that you know this, yet I venture to say that if most of you will just stop and think about the hand-feeding of stock, as you know it to be carried out by yourselves and your neighbours, you will admit—(*a*) That there is little, if any, systematic storage of fodder to feed with; (*b*) that, for cattle in particular, there is little feeding resorted to until dry conditions have so far advanced that the stock are poor, or even at starvation point; and (*c*) that when this state is reached, the object of the feeding is merely to keep the stock alive, and for this purpose almost anything is seized upon to feed—anything which the stock will eat. In brief, it is merely a question of getting something into the animal's stomach which will maintain life, but no consideration has been given as to whether the feed given is really being used as effectively as possible, while certainly no thought is given as to whether some modification of the feeding were possible whereby the feeding could be rendered a profitable undertaking.

However, for our example—

Suppose you had a steam boiler and 1 cwt. of coal. The amount of steam you could get by burning the coal would depend on a number of points. You could not expect to get good results if the boiler tubes were dirty, the chimney stack broken and full of holes, and the boiler plates covered with scale inside. Even supposing these points were in order, you could not get the best results unless the coal were fed to the firebox carefully and systematically, so as to maintain an even high-temperature fire. It is much the same with feeding stock. First, the animal to be fed must be worth the feeding, or else feeding cannot pay. Second, the feed can be given wisely or badly, resulting in good or indifferent results accordingly.

But let me take the steam-boiler example a stage further. Suppose that you have ten units of fuel, each weighing 1 cwt. and each having been got from some different source, so that one unit might be hard, clean coal, another dirty, slaked coal, a third good, solid wood, a fourth semi-decayed wood which is damp, and so on. If the boiler is fired with each of these different fuels separately, each will give a different steaming value. To know the weight of fuel used, therefore, is not sufficient. We require also to know the quality of the fuel. Knowing this latter, we would be in a position to estimate the value of each different fuel or to say how much we would be willing to pay per ton for each class of fuel. In truth, if we want to produce steam cheaply, the most important thing for us to know is the quality of the fuel. In much the same way feeds vary in quality, and we have to know the quality of our feeds if we are to feed stock successfully. With our boiler we can imagine a fuel so bad that, no matter how much we use, we

cannot keep up steam. In fact, we can choke up the firebox by using too much, but we cannot get a hot fire. Such a fuel is expensive, no matter how little we pay for it. In the same way we can have a feed which is of such poor quality that it will not nourish the animal, even though the animal can be persuaded to eat its fill of the feed. To use such a feed is mere waste of money. Again, a fuel may be so good that, even using a little of it (sufficient has to be used to keep a bed in the firebox) gives too fierce a heat, with the result that a great deal of heat is lost up the chimney-stack. It is the same with feeds for stock; some feeds are so rich in quality that quite a little of them would nourish the animal, but this amount would be too little to comfortably fill the animal's stomach and so satisfy its hunger, while if sufficient were fed to satisfy the hunger-craving, *i.e.*, to fill the stomach, a great deal of useful nourishment would be wasted by passing through the animal as dung. With our fuels we would have to blend them so as to get one suitable for our firebox. So with our feeds, we have to mix them or balance them off so as to get an efficient feed which will nourish the animal well, and usually most cheaply.

The feeding of stock is not entirely similar to the firing of a boiler. Still, the above illustration sets out fairly clearly what feeding is, and indicates the lines on which we must proceed if we are to get satisfactory results from stockfeeding.

To begin with, we will have to learn what our feeds consist of. When a feed is analysed, it is separated into quantities or percentages of the substances set out in the following table:—

- Feed
  - Moisture
  - Dry Matter
    - Ash
    - Organic Matter
      - Proteins
      - Fats
      - Carbohydrates and Fibre
      - Active Principles

First the feed is separated into moisture and dry matter. This is done by taking a known weight of the feed and placing it in an oven at the temperature of boiling water, and drying it until there is no further loss of weight. The loss in weight is the moisture present, while what remains is the dry matter. It is of importance to know the percentage of moisture in a feed, because the water present is of no value for the nourishment of the animal. The water in the feed is readily absorbed by the animal system, leaving the dry matter in the stomach for digestion. The animal gets its nutriment from this dry matter. But water in a feed will give it bulk. Hence, when an animal eats largely of moist succulent feeds it quickly gets that satisfied feeling of a full stomach, and stops eating. Soon afterwards, however, when the water of the feed has been absorbed by the animal's body, there remains in the stomach only a comparatively small amount of dry matter, insufficient to comfortably fill the stomach, and hence there results an empty void-like feeling. The small amount of dry matter thus remaining is not sufficient for a proper process of digestion, and, further, it may not be enough to properly nourish the animal. When we consider our own feed, we get a parallel case when we fill ourselves, say, with porridge. A couple of plates of porridge will send us from the breakfast-table feeling full. But a couple of hours afterwards this full feeling will be replaced by a feeling of emptiness. It is the same with stock when their feed contains too much moisture.

In truth, it is necessary to so mix our feeds that when the animal has satisfied its hunger it has taken into its stomach a sufficient quantity of dry matter.

In regard to this, some of you may state that you have fed cattle on green barley, *i.e.*, a wet, succulent feed. But I must remind you that this is not the only feed the cattle get. They are allowed to run in the paddocks, and there they pick up a considerable amount of dry grass, thus correcting the amount of dry matter.

Again, dairy stock do well on green grass. But here, again, you must recognise that the cattle, as they graze, select their own feed and adjust their ration in a manner quite beyond the power of man.

The second stage in the analysis of the feed divides the dry matter into mineral ash and organic matter. To get this, the dried feed is burnt until there is no further loss of weight. The dry matter that burns away is the organic matter, and what remains and will not burn is the mineral ash.

The organic matter contains the substances which nourish the animal, and we will consider this later. At present, we will consider the mineral ash. The animal obtains from this ash several substances which are necessary for its life. First there is the material to make the bony structure, *i.e.*, the lime phosphate (calcium phosphate) and lime carbonate (calcium carbonate). Next there is the iron which is required for the animal's blood. Again, chlorides are present in the ash, and these are necessary for portion of the digestion process.

With the exception of common salt, which we give stock as a lick, the ash of mixed feeds usually contains sufficient mineral ash to meet all the needs of the animal. We know, however, that on some country stock make good bone and thrive well, while on other country they do not. In fact, we know of some country on which young stock will not develop sound bone and on which older stock will gradually waste out their bony framework. This is undoubtedly due to some deficiency in the ash content of the feed, for on this poor country where the animals suffer from what may be termed a "*bone starvation,*" a correction can be made by feeding one of the calcium phosphates to the stock, *e.g.*, crushed bones.

Let us now consider the organic matter. In the analysis this is divided into several classes of substances, the chief of which are proteins, fats, carbohydrates, and fibre, and active principles. Each of these classes of substances plays a different part in the feeding of the animal, and this we will proceed to describe.

Proteins.—These are highly complex chemical compounds, and they all contain nitrogen. They are the most important portion of the nitrogenous part of the feed. Proteins are always associated with life, whether plant or animal. They might be termed the "life compounds." Typical examples of proteins are white of egg, casein in milk, the lean portion of meat. Proteins are manufactured in plants. They are not manufactured by the animal. Animals obtain their protein matter directly or indirectly (*i.e.*, by eating animals which feed on plants) from plants. Plants, however, do not contain large quantities of protein. The plant structure is chiefly composed of carbohydrates and fibre. Animals, on the other hand, are composed chiefly of proteins. The muscular tissue, hair, skin, nails, brain, are all protein matter. The main value of the proteins in a feed is to supply the material to build up the protein tissue of the animal. No other substance can take the place of the proteins. As the animal wastes an amount of tissue each day, just in the ordinary process of keeping alive, it is necessary that an animal should receive in its feed each day a definite amount of proteins if it is to remain alive and healthy. But if the animal is called on to work or produce milk, say, or grow, which is an increase of body tissue, or do anything in excess of merely remaining alive, so the demand for proteins in the feed is increased, being greater the greater the demands made on the animal.

If an animal is fed no proteins at all, it will remain alive for some time, drawing on the protein substance of its own body. An animal, however, cannot suffer a great reduction of its protein substance. It would soon become weak and languid, and would finally die by just fading out.

It is possible, therefore, to have what we might term "protein starvation." That is, we might be feeding ample feed as regards quantity, but this food might contain so little proteins that the animal, even though it might be fat, would die. We sometimes see this effect in children who are fed too much starchy food. They get fat and flabby, but are not healthily strong. Proteins, therefore, are the flesh and tissue builders for the animal, but, besides this, proteins can be converted into body fat (*see* below), or may be used for the production energy (also *see* below). It is important to note that the amount of proteins in plants increases up to the time when the seed begins to set. Up to this time the proteins are distributed throughout all the plant, but as the seed sets the protein matter is withdrawn from the plant and is concentrated in the seed. You can understand, therefore, why we cut a crop before the seed sets if we want to make it into hay. The best time to cut each crop varies with the kind of crop; still, the above statement holds good in its generality. Again, we should expect seeds generally to be rich in proteins, and this is so, though different seeds vary in regard to their protein content.

Fats.—The amount of fat and oil in plants is not generally large, though some seeds—for example, linseed and cotton seed—contain large quantities.

Fats are compounds which do not contain nitrogen. When digested by the animal, the vegetable fats are converted into body fat for the animal, this body fat being distributed throughout the body tissue.

Animals are able to stand big variations in the amount of body fat stored in the body. When we speak of an animal being lean we merely mean that there is very little storage of body fat. When an animal is fat and topped up, body fat is intermingled throughout the body tissue. It is this fat throughout the tissue which makes the meat tender. Thus we see we can have a third kind of starvation, namely "fat starvation."

It is fat starvation which is most obvious, because it at once appeals to the eye in the condition of the animal.

From the animal standpoint, storage of fat is merely the storage of energy in the system which can be drawn on under adverse conditions. Ultimately, therefore, the fat is converted into energy to enable the animal to move and work and maintain its body heat.

One pound of fat has about two and a-quarter times the heat or energy-producing value of 1 lb. of proteins, or 1 lb. of either carbohydrates or fibre.

The chief value of fat in the food is to produce body fat in the animal, but the fat may be used directly for the production of energy for the animal.

We do not usually feed large amounts of fat, because fatty foods are too heating.

Carbohydrates and Fibre.—There are many kinds of sugars and starches and plant fibres. All of these various substances are classed under this heading of carbohydrates and fibre. The sugars and starches, especially when pure, are readily digested and assimilated by the animal. With plant fibre, however, we have a big variation. Thus the fibre in young, green plants is fairly readily digested, while the fibre in fully matured plants—for example, in wheaten straw—is only partially digestible. Generally speaking, the more fibre a feed contains, the less digestible all the ingredients of the feed, both proteins, fats, and carbohydrates.

The carbohydrates and fibre form by far the largest part of the feed, because plants are composed chiefly of these substances. The chief function of this portion of the feed is to produce energy for the animal—energy for muscular action and the heat for the maintenance of the animal's body temperature. Beyond this, however, the carbohydrates and fibre can be converted into body fat by the animal, though the fat formed from this part of the feed is generally softer and more flabby than body fat produced from the fats in the feed.

It has been mentioned that all the fibre is not digested. This is of importance for the process of digestion. This indigestible matter keeps the stomach and intestines distended, and is the solid matter on which the feed is ground up to a fine state, so that it can be better acted on by the digestive juices. Cattle and horses and sheep require comparatively large quantities of indigestible fibre in their feeds —the cattle and sheep because of the nature of their digestive system, with its four stomachs; the horse because of the peculiar formation of its teeth, which has been developed for the special purpose of grinding up hard, dry feeds. On the other hand, pigs and human beings cannot manage feeds containing much indigestible fibre, while much the same applies to poultry. Poultry, however, have a special arrangement to assist in grinding their feed, an arrangement practically replacing the teeth of animals. This is the gizzard, which contains small stones and grit through which the feed, softened with an inflow of digestive juices, is worked and rolled until it is in a fine state of subdivision.

Active Principles.—The amount of these substances in any feed is very small, and the percentages are not shown in the analysis. Our experience, however, is generally quite sufficient to give us sufficient information with regard to this portion of a feed. Thus we know that certain feeds are laxative in their effect, *e.g.*, bran and linseed meal; other feeds are binding, *e.g.*, cotton-seed meal. Again, sorghums are poisonous to cattle at a certain stage in their growth. These differences in the feeds are due to the presence of small quantities of substance which are here grouped under the term "Active Principles." They are mentioned merely to impress on you that we have to have a knowledge of the general effects of each feed on the animal system. We have to modify the use we make of a feed in accordance with this knowledge.

Digestibility.—In the above discussion we have dealt with the composition of a feed as it would be determined by a chemical analysis. During the discussion on the fibre content of the feed, it was indicated that a part of the food was not digested. That is, that a part of the food was not dissolved in the process of digestion and absorbed by the animal system, but remained in its solid state, to be ultimately voided as dung.

Each feed differs as to the degree to which it is digested, but to determine this degree we can no longer depend on chemical analysis. Instead, we have to carry

out feeding tests with animals. The degree to which a feed is digested is called the digestibility of the feed.

It is important to know the digestibility, because it is only that portion of the dry matter of the feed which is digested and absorbed which can be utilised for the nourishment of the animal. As stated above, the undigested portion of the feed passes through the intestines and is voided as dung.

A great deal of work has been done in this matter of feeds and feeding, with the result that we now have the chemical analysis of practically all the feeds, and their digestibility has also been determined by feeding tests with animals. Combining these two, you will find in all books on feeding tables of feed analysis under the headings somewhat as follows. A few analyses are shown to illustrate the point.

IN 1 LB. OF FEED THE QUANTITY OF :—

Name of Feed.	Dry Matter.	DIGESTIBLE.				Ratio.
		Proteins.	Fats.	Carbohydrates and Fibre.	Total Nutrients = Proteins + Fat × 2¼, + Carbohydrates and Fibre.	
Maize Silage	·264	·014	·007	·142	·172	1:11·3
Lucerne Chaff	·918	·105	·010	·402	·530	1:40
Wheaten Straw Chaff ..	·904	·008	·004	·352	·369	1:45·1
Maize (Grain)	·894	·078	·043	·668	·843	1: 9·8
Bran	·881	·119	·025	·420	·595	1: 4·0
Linseed Meal	·902	·302	·069	·320	·777	1: 1·6
Green Lucerne	·282	·036	·009	·121	·166	1: 3·6

COMBATING THE BLOWFLY.

OFFICIAL REPORT ON THE SPECIAL EXPERIMENTS AT DALMALLY.

Mr. W. A. Russell, of Dalmally, reporting to the Chairman, Special Blowfly Committee, Institute of Science and Industry, Brisbane, states:—

"Since my last report, dated 27th June, the work has been proceeding as usual. The fly has been more active than has been the case since the inception of the experiments, but the losses are now able to be greatly minimised, and generally can be kept at a reasonable figure.

"The results of the experiments, extending over three and a-half years, are most gratifying, and if the full results of this work could be published, it will be the means of saving the pastoral industry a large amount of wasteful expenditure. In this I refer to the number of expensive and absolutely useless specifics that are on the market, claiming to protect sheep from the ravages of the blowfly pest. Experiments will show that, generally speaking, they are useless, and give no protection at all, and, on the average, cost about 2d. to 3d. per sheep and as high as 1s.

"The experiments here have always been carried out with a careful consideration to the commercial possibility of dealing with stock in numbers, and so far the results have been gratifying, and the cost reasonable.

"The results show that all specifics which have to be hand-dressed, and the sheep cleaned up with shears before applying, have failed; and that so far one thing is of any value in dealing with the pest, and that is arsenic. This must be in a soluble form, and it has been found that it can be used with safety on sheep, young and old, shorn and woolly. I have increased the strength from 0.6 to 1 per cent., and up to this point the result has been the greater the strength the greater the efficiency. I do not think, from the results, that there is any need to go beyond this strength, as at 1 per cent. it kills all maggots within six hours. As soon as it is jetted on the sheep the maggots get uneasy; those that can get away drop off the sheep, and the others die in the wool. The sheep then has rest, can feed, and recovers. The examination of the sheep shows that the arsenic, even in the strength of 1 per cent. (which means 10 lb. of arsenic to 100 gallons of water, with of course the necessary soda ash or soda in order to dissolve the arsenic), has a healing effect on the sheep.

"The difficulty, so far, is to fix the arsenic in the wool, and so retain immunity from further infestations, which, however, as a rule are very slight if the jetting is properly done. I advocate the use of arsenic and soda only. The presence of sulphur is of very little value, if any, as a deterrent of the fly trouble; maggots will work in sulphur, but they cannot stand arsenic.

"Tests are being carried out in the laboratory as to what percentage of arsenic will kill the maggots. So far I have found that a solution of 0.125 is fatal to them, but it is rather slow, and if only jetted on in weak solutions, as the sheep dry, the percentage seems to disappear and is not effective.

"The analysis of the wool has been carried out in Brisbane by the Government Analyst, and it is due to the results obtained by him that we have been able to increase the strengths used. Graphs also bave been prepared, and are, I expect, available to you. With the more recent results these graphs are instructive, and when we are quite certain of the percentage of arsenic which gives protection and immunity, this will also be included in the graph.

"Many districts suffer from fly attack over the body of the sheep, as well as the breech, so I have tried dipping in arsenic, and so far have used it up to 0.5—viz., 5 lb. of arsenic to 100 gallons of water, with no harmful results. I am increasing the strength to see what can be safely used; but owing to the possible loss of sheep in swimming them in these mixtures, only very few can be done at a time, and the results watched. These experiments I am now proceeding with, and you will have a good many of these results in my next report."

On the subject of arsenic and oil, the report proceeded: —

"It is not possible to dissolve arsenic in oil, but a good many experiments have been carried out with oil with arsenic in suspension, and these are still under observation. A very cheap oil has been found, and the cost will be very reasonable. This work is not far enough advanced yet to offer any opinion on, except that results so far have been most encouraging.

"I think that the main experiments for the coming year should be jetting with arsenic, and dipping in arsenic, as outlined in my report to you of 27th June, together with the trials of arsenic and fat, and arsenic and oil, which, so far, has proved very effective.

"The analysis of wool, I think, should be continued, and I will, as before, send samples and specifics to Mr. Henderson, unless otherwise directed by your committee."

Mr. W. G. Brown's Report.

Mr. Brown, State Sheep and Wool Expert, and a member of the State Committee, in the course of his report to the Chairman, said:—

"In accordance with the instructions of your committee, I proceeded to Dalmally on the 5th October, inspected the 750 stud sheep specially used for experiments, and append herewith details.

"*Scope of Experiments.*—The scope of the experiments for the year 1921 was designed to test such of the specifics as had been found at least useful during the past three years at Dalmally, not only as to their efficacy, but from the commercial side—that is, their relative expense of operation.

"*Discussion of the Analysis.*—Taking the analysis, it will be seen, first, that with two exceptions, No. 2 in Group 1 and No. 2 in Group 3, the infestations are pretty nearly the same for all specifics. No. 1 in Group 1 was a mixture of arsenic and oil in the proportion of 0.5 per cent. of arsenic. This gave the lowest infestation of all specifics, 35 sheep. No. 2 in Group 3 gave 37 sheep infested, the arsenical contents being 1 per cent. in the jetting solution. The controls, which were untreated, naturally gave the highest number of infestations—*i.e.*, 67. Fifty sheep being used in the trials of specifics.

"Of the 750 sheep used in the experiments, 16 died from various causes, 3 only of which deaths were due to flies. It will be noted that the sheep were jetted on the 26th, 27th, and 28th January, 1921, and the 1st, 2nd, and 3rd of February, 1921. Consequently there was a period of eight months covered by these experiments.

"It will also be noticed that the first cases of infestation were observed on 5th April, about two months after treatment, but they were comparatively few to 1st July. From then onwards the infestations became increasingly greater in numbers. This, in the light of the fact that the arsenic disappears rapidly after application, is only to be expected.

"*Bad Fly Season.*—Although the flies have been very bad since February, serious infestations did not occur until July, a period of four months since the animals were jetted.

"*Amount of Specifics Used.*—The specifics were mixed and used by me personally, and the number of sheep per gallon used was about ten.

"*Infestation Proportions.*—In further discussing the analysis, it will be seen that of the 700 plus controls untreated, a total of 795 infestations were found. This shows that sheep were attacked more than once. The exact number attacked was 473, leaving a balance of 277 sheep which had not been attacked at all over the period between jetting and shearing. I carefully inspected all the sheep as they were shorn, and could see no difference between those which had been infested and those which had not, as far as constitution, breeding, or quality of fleece was concerned.

"*Rainfall.*—The rainfall over the whole period from 26th of January until 9th October is as follows:—February 66 pts., March 312 pts., April nil, May 130 pts., June 427 pts., July 841 pts., August 101 pts., September 77 pts.; total, 1,954 pts. This rainfall is considerably above the average for the period under review, and will probably account for the constantly decreasing amount of arsenic which was found in the wool as analysed by Mr. J. B. Henderson, Government Analytical Chemist, which was submitted to him periodically by Mr. Russell. Doubtless the wet season and the warm winter will account for the very great prevalence of the flies over such a prolonged period. At present writing, I have never seen the flies so numerous or so deadly: this in spite of so few dead sheep to be found in such a prolific season for herbage and grass. The whole flock on Dalmally is in splendid fettle.

"*The Sheep Experiments Again.*—In further reference to the analysis, it will be seen that the numbers of sheep to each specific, only a comparatively small number (50) was used. The greater experiments, and the ones to which I attach the most importance, were made on very much larger numbers. I shall not give close details such as the Field Book furnishes, but shall give an outline of the operations.

"*Experiments with Larger Numbers.*—No. 1: 1,600 ewes due to lamb on 18th March, were jetted with a solution of 0.6 per cent. of arsenic, soda ash and water being the solvents. On 24th May 2 per cent. were found blown, and dressed. There had, by then, been a drop of 76½ per cent. of lambs. Two per cent had died from various causes, and a small percentage of lambs had been attacked by flies. No. 2: 1,335 ewes, due to lamb on 18th March, were jetted with a solution of 0.8 per cent. arsenic in the solution. Lambing was 60 per cent., 6 per cent. were struck, and 2 per cent. were dead or missing on 27th May. No. 3: 2,680 ewes jetted with a solution, used at a strength of 0.6 arsenic. These sheep were maiden ewes, and dropped 50 per cent. of lambs; 19 per cent. were found blown, mostly very lightly. Two per cent. were dead or missing. No. 4: 1,780 ewes jetted with a solution on 27th May at a strength of 1 in 20 of water. Arsenical strength not known. Nineteen per cent. were found blown on 8th June. A percentage of 40 per cent. of lambs. No. 5: 575 ewes were jetted on the 31st May, with a solution equal to 0.8 per cent. arsenic. These ewes had been jetted three and a-half months previously. On 15th June no fly attack had occurred since jetting. Out of 1,800 ewes in this paddock only 3 per cent. were found blown, the lambing being 76 per cent. No. 6: 325 ewe weaners, seven months old, jetted on the 3rd September, with 1 per cent. arsenic; examined by me on the 11th October, and were found to be blown to the extent of only 2 per cent. The flies attack ewe weaners first in a mob of sheep, and as the pest is now at it very worst since operations began, this is a most excellent record.

"*Losses from Flies through the Year.*—Mr. Russell assures me that in this very bad season for flies his losses have been almost negligible, less than 4 per cent. in lambing ewes, from all causes, loss from flies less than 2 per centum.

"*Are Some Sheep Immune from Flies?*—A question which appears to me should be thoroughly investigated is: Why are there any sheep in a flock not attacked when flies are so numerous? In the case of the 700 stud ewes treated here, plus 50 controls untreated, last January 473 were blown, many badly, and 277 were quite untouched. There were 795 infestations on 473 sheep. Reasoning by analogy, it is known that in every herd of cattle on tick-infested country there are individual animals which do not carry ticks. May not a similar immunity be enjoyed by sheep from fly infestation? This should be a matter for serious investigation by your committee. It should not be a difficult matter to obtain, from a fly-infested flock, members which do not appear ever to be attacked by flies. It seems to me that 750 sheep running together in the same paddock in the worst fly season we have seen, should all have been struck sooner or later in the eight months they have been exposed to infestation.

"FUTURE OPERATIONS.

"*No. 1 Experiment.*—After all the sheep were shorn we decided that a hitherto highly successful experiment should be carried on further, so that the first which was conducted on only small numbers, should be proved by the second on much greater numbers (say, 3,000 sheep). We put before you our reasoning. According to

analysis, arsenic used on sheep, in the proportions we have used, will disappear or become ineffective in a comparatively short period, not more than two or three months. In an abnormally wet year, such as this has been, it is probable that the poison has been washed out of the fleece. We aimed at fixing the arsenic in the wool for a longer period. Tallow sets hard, and flies will not blow it; therefore we warmed tallow, adding a little crude oil and arsenic. This mixture sheds water when it sets. We took 325 ewe weaners and applied such a mixture in the proportion of three-quarter gallons melted tallow, 2 pints crude oil, and 2 oz. of arsenic. This mixture was applied warm in the form of a swab on the breech of the animal. A few days in a bad season for flies, such as this, will show us what value this process possesses.

''*No. 2.*—Another experiment now in operation is the use of crude mineral oil in which arsenic is in suspension to the extent of 1 per cent. arsenic. This will be swabbed on the breech of 1,000 maiden ewes, the most susceptible of all sheep to fly attack. Mr. J. B. Henderson, Government Analytical Chemist, is now trying out a theory of his, in the direction of suspending arsenic in mineral oil. When he is able to give us the method this will be used on 2,000 or 3,000 ewes.

''*No. 3.*—Mr. W. A. Russell desires to jet about 500 ewe weaners with oil alone. He has found an oil which makes the experiment, if successful, the cheapest method on the market. Not more than 1d. per head will be the cost over the whole year.''

CONCLUSIONS.

Upon this data Mr. Brown arrived at these conclusions:—

''It is certain that if a jetting solution containing not less than 0.7 per cent. of arsenic be used, then ewes especially will be immune during lambing time (a period of from eight to ten weeks).

''*Arsenic.*—Although at first I was very dubious about using arsenic in comparatively strong solution as an application to minimise fly trouble, I am satisfied now that it can be used at a strength of 1 per cent. as a jetting formula with perfect safety to the animal, and with excellent results as a preventative against the fly. Mr. Russell has been fearless in its application in strong solution, and has, besides, tried out many specifics of which little was known. I regret to say that on several occasions he has lost sheep.''

INFESTATION ON GROUP SERIES.

Following are the details of the analysis which Mr. Brown discusses in the course of his report:—

	Apl. 5th	Apl. 12th	May 1st	May 9th	May 13th	Jne. 6th	Jne. 14th	Jly. 1st	Jly. 20th	Aug. 3rd	Aug. 17th	Sep. 1st	Sep. 16th	Shorn Oct. 5th
Group 1—														
No. 1 ..	1	1	1	0	1	2	4	5	6	3	7	9	12	52
No. 2 ..	0	3	0	0	2	1	3	4	3	5	4	4	6	35
No. 3 ..	3	1	1	2	—	1	3	7	8	2	6	16	8	58
No. 4 ..	2	4	3	0	—	1	3	6	5	2	6	12	10	54
Group 2—														
No. 1 ..	1	1	1	0	—	2	2	4	4	1	7	10	11	44
No. 2 ..	2	2	2	2	2	3	5	2	6	7	5	8	9	55
No. 3 ..	1	2	2	1	1	2	4	1	7	5	9	7	16	58
No. 4 ..	3	1	1	1	1	3	4	8	6	6	7	11	8	60
Group 3—														
No. 1 ..	1	1	1	2	2	1	3	—	7	7	2	13	14	54
No. 2 ..	0	3	2	3	—	2	4	3	6	4	4	4	2	37
No. 3 ..	0	1	1	1	2	4	5	4	10	8	3	9	12	60
Controls Untreated	1	8	1	2	4	6	10	11	4	3	4	2	11	67
Group 4—														
No. 1 ..	0	1	1	1	2	1	2	4	5	6	7	8	9	47
No. 2 ..	0	3	2	1	2	3	6	5	7	2	10	12	8	61
No. 3 ..	0	6	2	1	1	3	5	8	3	6	5	3	10	53
	15	38	21	17	20	35	63	72	87	67	86	128	146	795

All specifics resisted fly attack for seven weeks.

277 equals 37 per cent. of whole number.

Sheep never infested at all.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR OCTOBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ..	31 July, 1921	1,523	3·8	64·60	
Iron Plate	Jersey ...	12 July ,,	1,072	4·8	58·40	
College Mignon ...	,, ...	7 July ,,	847	5·2	52·60	
College St. Margaret	,, ...	25 Sept. ,,	957	4·8	52·50	
Hedges Madge ...	Holstein ...	15 Aug. ,,	1,176	3·8	50·10	
Miss Security ...	Ayrshire ...	20 Aug. ,,	1,483	3·0	49·59	
Prim	Holstein ...	9 Mar. ,,	1,220	3·6	49·07	
Bellona	Ayrshire ...	26 June ,,	1,072	4·0	48·60	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	949	4·3	45·30	
College Cold Iron	Jersey ...	10 Mar. ,,	720	4·8	39·80	
Miss Betty ...	,, ...	7 July ,,	763	4·0	34·40	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	454	5·8	31·06	
Netherton Belle ...	Ayrshire ...	30 Nov., 1920	575	4·6	31·03	
Glow IV.	Guernsey ...	28 Aug., 1921	726	4·3	30·89	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	583	4·4	29·60	
Dawn of Warragaburra	Jersey ..	15 Oct., 1920	450	5·3	28·30	
Miss Fearless ...	Ayrshire ...	26 May, 1921	606	4·0	27·01	
Songstress	,, ...	4 Mar. ,,	422	5·2	26·40	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	448	5·0	26·20	
Charming Damsel	Ayrshire ...	12 May, 1921	615	3·6	25·70	
Thornton Fairetta	Jersey ...	15 Mar. ,,	377	5·4	24·40	
Snowflake	Shorthorn...	21 Dec., 1920	419	5·0	24·40	
Royal Mistress ...	Ayrshire ...	19 Mar., 1921	570	3·8	24·06	
Rosine	,, ...	19 Jan. ,,	584	3·6	23·40	
College Evening Glow	Jersey ...	10 Oct. ,,	440	4·6	23·40	
College Grandeur	,, ...	29 Dec., 1920	425	5·0	23·30	
Confidante ...	Ayrshire ...	12 May, 1921	484	4·1	22·10	
Waite Blossom ...	Guernsey ...	21 May ,,	392	5·0	22·10	
Confidence... ...	Ayrshire ...	8 Feb. ,,	462	4·1	21·90	
Comedienne ...	Jersey ...	26 Nov., 1920	436	4.2	21·20	
Gatton Empire Lass	Guernsey ...	3 May, 1921	276	6·2	20·70	
Hedges Dutchmaid	Holstein ...	26 May ,,	557	3·2	20·40	

The Horse.

CERTIFICATES OF SOUNDNESS.

October list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
	PONIES.	
Son Harold (L) ..	N. Lochran	Mary street, Gympie
Clyorie (L) ..	J. W. Ross	Goomboorian, *viâ* Gympie
Bonnie Mischief ..	D. Johnson	South Side, Gympie

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, OCTOBER, 1921.

Generally speaking, the laying for the month was excellent. The following scores of individual hens are worthy of note:—H. C. Towers's "F" White Leghorn has laid a sequence of 65, unfinished; T. Fanning's "C" of 55, unfinished; W. Fraser's "A" 42, unfinished; T. Eyre's "A" of 36, unfinished; E. Morris's "A" Black Orpington completed a sequence of 51 on the 22nd of the month. The highest score for six hens among the Black Orpingtons was made by Mr. R. Burns's pen, with 165 eggs; in the light section Mr. Fanning's pen of White Leghorns laid 162 eggs. The weather during the month has been dry and warm, at times very sultry. One death occurred, viz., Haden Poultry Farm's "A" bird (White Leghorn), through blindness.

The following are the individual records:—

Competitors.	Breed.	Oct.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns ...	153	903
R. Gill	Do.	138	903
*W. and G. W. Hindes	Do.	152	900
*Geo. Trapp	Do.	141	855
*Mrs. R. Hodge	Do.	150	851
F. Birchall	Do.	122	837
H. C. Thomas	Do.	116	832
*H. Fraser	Do.	148	830
*H. C. Towers	Do.	141	826
*C. M. Pickering	Do.	139	813
Oakleigh Poultry Farm	Do.	105	812
*T. Fanning	Do.	162	803
R. C. Cole...	Do.	121	792
W. A. Wilson	Do.	131	785
*W. Becker	Do.	132	777
*J. W. Newton	Do.	116	763
*C. Goos	Do.	136	757
H. Stacey	Do.	139	757
Mrs. E. White	Do.	132	750
Bathurst Poultry Farm	Do.	138	749
*Thos. Eyre	Do.	155	742
W. Barron	Do.	143	741
*R. C. J. Turner	Do.	139	740
M. F. Newberry	Do.	133	736
*Thos. Taylor	Do.	141	734
*E. Chester	Do.	120	729
*S. L. Grenier	Do.	141	726
*B. Chester	Do.	141	722
*E. A. Smith	Do.	148	713
*G. Williams	Do.	132	712
J. W. Short	Do.	120	706
*Mrs. L. Anderson	Do.	134	704
O. C. Goos	Do.	118	698
Mrs. E. Z. Cutcliffe	Do.	109	691
E. Stephenson	Do.	116	690
*Haden Poultry Farm	Do.	123	675
*W. and G. W. Hindes	Brown Leghorns... ...	112	662
*H. P. Clarke	White Leghorns ...	136	652
Linquenda Poultry Farm	Do.	96	651
W. M. Glover	Do.	119	627
Brampton Poultry Farm	Do.	125	599

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Oct.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	149	961
*R. Burns	Do.	165	894
Rev. A. McAllister	Do.	142	882
*J. Ferguson	Chinese Langshans ...	131	875
*T. Hindley	Black Orpingtons ...	135	871
*A. E. Walters	Do.	148	863
W. Becker	Langshans	153	861
*Parisian Poultry Farm	Black Orpingtons ...	143	845
Jas. P tter	Do.	90	828
G. Muir	Do.	131	828
Jas. Ryan	Rhode Island Reds ...	131	820
*C. C. Dennis	Black Orpingtons ...	136	820
Jas. Evers	Langshans	118	817
*E. F. Dennis	Black Orpingtons ...	136	789
*E. Morris	Do.	141	779
*J. Cornwell	Do.	130	774
*E. Stephenson	Do.	111	733
*R. Holmes	Do.	111	725
*N. A. Singer	Do.	152	724
C. Cumming	Do.	112	691
*Mrs. G. Kettle	Do.	144	688
*J. E. Smith	Do.	137	686
*H. M. Chaille	Do.	115	684
*A. Shanks	Do.	130	680
J. W. Newton	Do.	126	678
*E. Oakes	Do.	140	637
F. Harrington	Rhode Island Reds ...	134	609
T. C. Hart	Black Orpingtons ...	137	532
Total	...	9,141	52,519

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	140	154	164	141	167	137	903
W. and G. W. Hindes (W.L.) ..	160	139	149	163	160	129	900
Geo. Trapp	144	135	144	139	152	141	855
Mrs. R. Hodge	140	150	156	144	151	110	851
H. Fraser	161	119	145	133	141	131	830
H. C. Towers	143	124	141	110	137	171	828
C. M. P ckering	151	139	131	116	154	122	813
T. Fanning	148	127	143	124	127	134	803
W. Becker	155	147	118	120	147	90	777
J. W. Newton	135	150	150	128	85	115	763
C. Goos	131	148	99	95	112	172	757
Thos. Eyre	129	125	85	135	138	130	742
R. C. J. Turner	129	117	117	110	132	135	740
Thos. Taylor	121	135	119	98	109	152	734
E. Chester	131	132	113	118	117	118	729
S. L. Grenier	126	145	96	124	121	114	726
B. Chester	112	119	139	112	136	104	722
E. A. Smith	151	121	123	117	112	89	713
G. Williams	166	129	93	103	111	110	712
Mrs L. Anderson	120	131	116	108	127	102	704
Haden Poultry Farm	72	106	123	123	120	131	675
W. and G. W. Hindes (B.L.) ..	97	103	94	114	110	144	662
H. P. Clarke	149	92	110	84	114	103	652

RESULTS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	96	140	182	131	169	176	894
J. Ferguson	139	134	135	162	151	154	875
T. Hindley	162	149	155	112	150	143	871
A. E. Walters	156	150	135	188	137	147	863
Parisian Poultry Farm	135	141	143	179	102	145	845
C. C. Dennis	143	127	120	150	141	139	820
E. F. Dennis	113	141	132	129	130	144	789
E. Morris	145	137	87	150	130	130	779
J. Cornwell	126	113	131	151	122	131	774
E. Stephenson	139	117	124	120	100	133	733
R. Holmes	99	119	124	131	151	101	725
N. A. Singer	122	108	116	120	111	147	724
Mrs. G. Kettle	110	130	145	75	103	125	688
J. E. Smith	149	158	116	94	88	81	686
H. M. Chaille	82	127	121	144	121	89	684
A. Shanks	88	114	111	123	115	129	680
E. Oakes	82	121	107	138	98	91	637

CUTHBERT POTTS,
Principal.

THE 1921 SUGAR CROP.

In June last the estimate of cut cane for the 1921 season in districts below Townsville was 2,161,000 tons. The General Superintendent of the Bureau of Sugar Experiment Stations, with his present estimate of 2,298,384, now proves the conservancy of his pre-harvest forecast. Favourable weather in the Lower Burdekin, Mackay, Bundaberg, and Wide Bay sugar areas was the main factor in this remarkable improvement in sugar prospects. North of Townsville excessive rain reduced the tonnage taken off, but, in spite of this handicap, this reduction was small when compared with the increase in the more southern canefields. In the Lower Burdekin, only 15 in. of rain were registered up to the 30th May, and the outlook then was not encouraging. Later in the growing season weather conditions improved, with the result that the extra weight of cane to be crushed in that locality alone amounts to 48,000 tons. It is now estimated that Queensland should manufacture something like 278,000 tons of sugar. If fewer tons of cane are needed to make a ton of sugar than last year, the output may be even higher. Last year's estimate for sugar consumption was about 285,000 tons, and it is stated that, for some unknown reason, this year's consumption will not be so great. Adding the New South Wales estimated production, 17,000 tons, it will be seen that the Commonwealth will have an abundance for this year, and perhaps a carryover to next season. The present estimate over the June figures is about 28,000 tons of manufactured sugar.

SOUTH COAST CANEFIELDS.

Reporting upon the Logan and Albert cane districts, the General Superintendent of Sugar Experiment Stations said that all the mills in that locality had now finished operations for the year. The crushing has been a small one, but, owing to the decline in the price of arrowroot, canegrowing has come more into favour again. In an inspection of the district, a number of new areas had been noticed under cane. The re-erection of practically the whole of the Nerang mill at Pimpama Island, by Mr. William Heck, had provided a fine crushing plant at that place, capable of dealing with from 30,000 to 40,000 tons of cane. This mill had worked very smoothly this year, and Mr. Heck deserves much credit for his enterprise in assembling so fine a plant. He expects a much larger crushing next season. The principal varieties grown about the Logan and Albert are Green Seedling, D.1135, and New Guinea 64 or "Purple Top." There is, however, far too much of the latter cane about the district, as it contains too much glucose to be a useful sugar producer. The district is now lookng well, though further rain would be welcome.

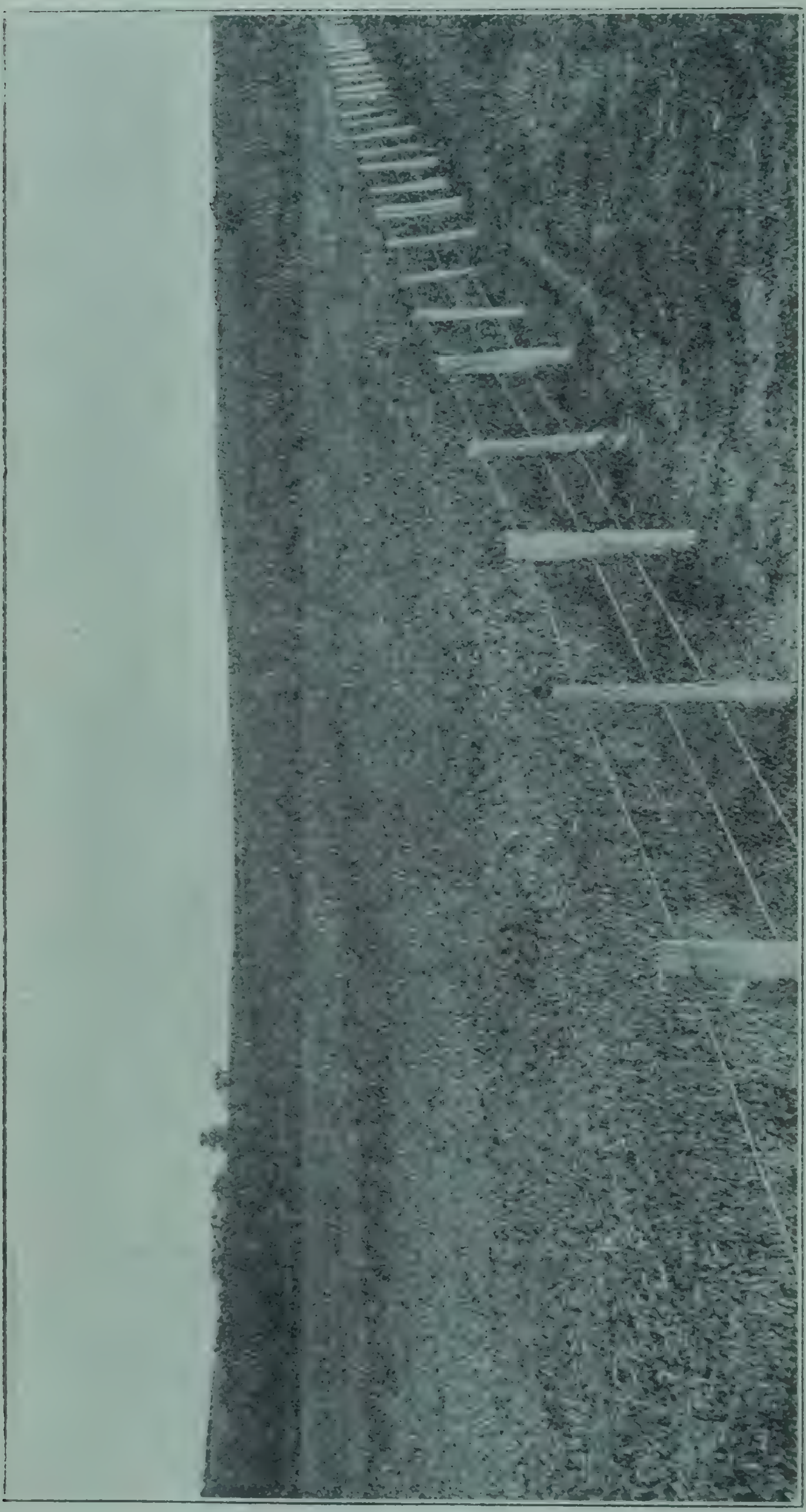

PLATE 78.—CROP OF SKINLESS BARLEY, KILLARNEY DISTRICT.

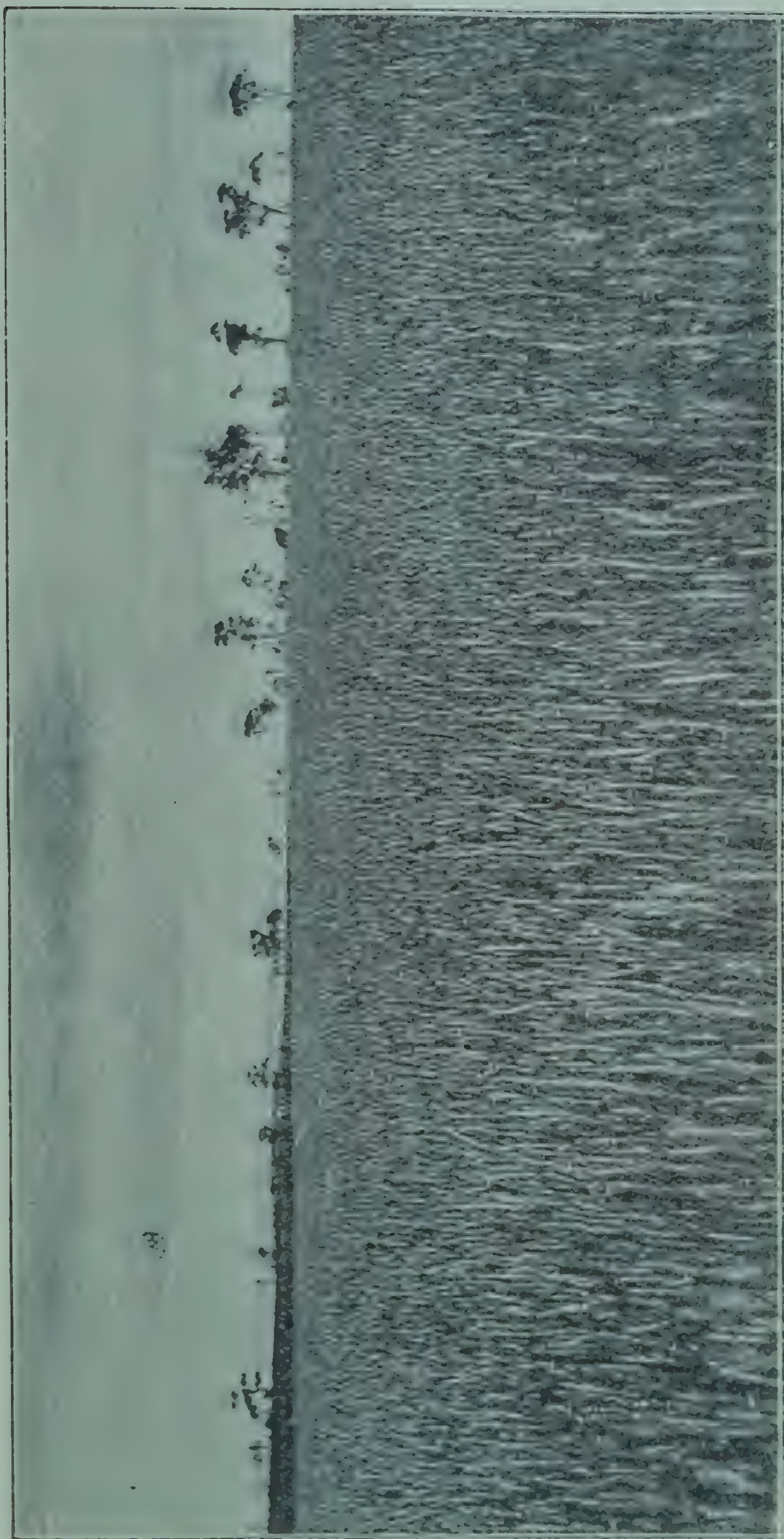

Plate 79.—A Wheat Crop, Clifton District.

The Orchard.

THE FRUITGROWING INDUSTRY—II.

By ALBERT H. BENSON, M.R.A.C.

In the first of this series of articles which appeared in the November number of this Journal, I pointed out that the most difficult problem by which our fruitgrowers are confronted to-day is not so much how to grow fruit as how to dispose of it when grown. This matter was discussed, and an attempt was made to show that disposal is largely a matter of distribution, and that the first step to be taken to place our fruitgrowing industry on a sound basis is to bring about a better method for distributing our fruits within the Commonwealth. Suggestions were offered respecting the best methods to be adopted in order to obtain this result, and thus bring about an increased consumption of our fruit.

In the present instalment, the question of opening oversea markets for fresh fruit is considered, as a further aid towards the disposal of our surplus. This is a new departure for this State, as hitherto our exports of fresh fruit outside the Commonwealth have been confined to sending a few pineapples from time to time to New Zealand, and to an attempt made some years ago to open up a market for pineapples and citrus fruits in Canada. Much, therefore, will necessarily have to be done before we can hope to build up a profitable export trade; still, as we must find a market for our fruit if our industry is to be kept going, we cannot afford to loose any more time, but must do our utmost to solve the difficult question of determining the best methods to be adopted in placing our fruits on oversea markets in such a condition that they will not only meet with a ready sale, but will realise a price that will leave a fair margin of profit to our producers.

It is possible that there will be many failures before success is finally achieved, as I firmly believe it will be, as there is always a great deal to learn in starting a new undertaking such as sending highly-perishable fruits to distant markets; and it is only by the exercise of the greatest care in the handling and packing the fruit and by carefully conducted experiments to determine the conditions best suited to their keeping and transport that it can be accomplished. Growers must not be disheartened if success is not immediately achieved, but must remember that the apple-growers of Tasmania had many serious losses before the best means of transporting their fruit was determined, and as our coastal fruits are of a more tender nature than apples, and will require a totally different treatment, it is only to be expected that we will have many initial difficulties to overcome before we are finally successful.

The first point to be considered is: What fruits can we grow that are suitable for export? By "suitable for export" I mean fruits that, provided they can be sent successfully to distant markets, will meet with a ready sale at a satisfactory price on those markets.

The only fruits that we can grow in Queensland that, in my opinion, will meet those requirements are citrus fruits, such as superior oranges and very carefully selected mandarins—midseason and possibly late apples from the Granite Belt, and, probably, pineapples. Other fruits might be tried, but I am very doubtful of their being a success.

With respect to citrus fruits, we have the advantage of the difference in the seasons in the northern and southern hemispheres, as our main crop is in season when the main crop in Europe and America is out of season; consequently, our fruit should reach the markets on the other side of the line when they are comparatively late. The marketing of the main crop of citrus fruits grown in the northern hemisphere is nearly over by the month of May, though late ripening varieties are available, to a certain extent, right through the season up to the time that the early main crop fruit is again on the market. Our main crop oranges and mandarins ripen during the months of April, May, and June, and should, therefore, meet with a fair demand, as we could supply the home markets from the end of May to about the middle of August with high-class fruit.

That a market exists I feel certain, but the question arises: How are we going to get our fruit there? The answer is: By the exercise of the greatest possible care at this end, to begin with, to provide the right condition on shipboard and see that these conditions are maintained throughout the voyage.

The handling of the fruit at this end is, I am afraid, going to be our greatest difficulty, as our growers do not yet realise the importance of packing nothing but absolutely perfect fruit in perfect condition, and the rigorous culling of any fruit that shows the slightest defect or has received anything except the very greatest and most careful handling. Absolutely sound and perfect citrus fruit will not decay, but will keep for a considerable period, whereas a bruised fruit is a spoilt fruit that will spoil other sound fruit with which it is packed.

The rotting or, as it is termed in the trade, "specking," of citrus fruits is due almost entirely to green mould fungus, which can only gain an entrance into the fruit when the skin is injured. Fruit with a perfectly sound skin will not speck. The injury may be so slight as not to be noticeable, but yet large enough to permit of the entrance of this fungus, and may be caused by sucking insects such as scale, or sucking bugs, by the puncture of fruit flies or the larva of the spotted peach moth, by sucking moths, or a thorn prick or by rubbing or other mechanical injury, and thus it often happens that a quantity of fruit is specked whilst still hanging on the tree. Bruising caused by the gathering of the fruit frequently leads to specking, and pulling instead of clipping is accountable for heavy loss from the same trouble.

Specking can be prevented by the exercise of proper care, which means—

1. Gathering and destruction of every specked fruit in the orchard, instead of allowing it to scatter millions of spores broadcast.
2. Handling the fruit with as much care as one would handle eggs.
3. Culling every fruit that shows the slightest sign of injury.
4. Keeping the packing-shed clean and free from specked fruit.
5. Sweating the fruit for at least seven days before packing.
6. Wrapping all fruit before packing and ensuring that it is not bruised during packing or in transit.
7. Use clean cases.

All these precautions must be taken by the grower, and if he thoroughly carries them out there is no question as to the fruit carrying satisfactorily.

For many years oranges and lemons have been sent to Australia from Southern Europe as ordinary cargo, and they have landed here in perfect condition. The reason of their release on local markets in good condition is due to the fact that nothing except absolutely sound fruit is placed in the case, and that it is handled with the greatest care. This fruit stands the journey through the tropics without loss, and if we take equal precautions there is no reason why our fruit will not carry equally as well.

The Department of Agriculture of the Union of South Africa has recently devoted a considerable amount of attention to the question of the wastage of citrus fruits in transit, and has published the result of their investigation in the form of a bulletin. The results obtained show that the primary cause of wastage is "specking," due to an injury to the skin, and this is tersely summed up in the following statement:—

> "The results of the investigations show conclusively that with ordinary care and intelligent handling it is possible to place South African citrus fruits on the overseas markets showing a negligible amount of waste."

This bears out the advice that has been given by this Department for many years, and the successful export of our citrus fruits will depend very largely indeed on the manner in which the grower does his part, as the carriage of perfectly sound fruit, properly packed, presents no difficulties that cannot be easily overcome.

With respect to apples, there is no great difficulty, provided the right varieties are selected and gathered at the right stage of development, carefully graded for size and colour, and only one size of fruit of one colour is packed in a case, and that every blemished, bruised, diseased, or defective fruit is rigorously excluded.

Owing to our climatic conditions, apples suitable for export ripen somewhat earlier in this State than in any other part of the Commonwealth, and we would therefore be the first on the home market with our fruit, and for the first one or two shipments in the season we would have no Australian competitors. The oversea market demands high quality fruit; in my opinion, therefore, it will be desirable to confine our attention to three or four varieties that do well here and attempt to build up a demand for these varieties.

With regard to pineapples, this is a matter that will require some very careful preliminary experiments to be carried out on shore before an attempt is made to send a consignment overseas, as it is essential that the exact conditions under which this fruit can be kept must first be accurately determined. Over twenty-five years ago I succeeded in keeping pineapples in perfect condition in cool storage provided

with perfect ventilation, but since then a number of experiments made to cool-store this fruit have not been successful; probably owing to the fact that the temperature was much too low, and that the air in the chambers was not fresh.

When in London during the Franco-British Exhibition of 1908, I saw pineapples stored in the cellars under Covent Garden Market that had been gathered at least seven weeks, and probably eight weeks, before. They were still in perfect condition, and from this experience, as well as from the success I had in my first experiment, I am of the opinion that the difficulty of sending our pineapples home in good order will eventually be overcome.

My opinion with respect to the exportation of all Queensland-grown fruits is that the main factor that will determine the success or otherwise of the undertaking is the care that is taken by the growers to see that nothing but perfect fruit, handled like eggs, and properly graded and packed, is sent. If this is done by the growers, I have little doubt that the transport difficulties now confronting us will soon vanish, and thus another outlet for the disposal of our fresh fruits will be obtained.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING OCTOBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1921.	Oct., 1920.
North Coast.	In.		In.	In.
Atherton	0·90	20	2·65	1·39
Cairns	1·97	39	3·96	1·31
Cardwell	2·01	49	5·31	5·75
Cooktown	1·14	45	1·59	1·90
Herberton	0·91	34	2·89	1·33
Ingham	1·52	29	4·91	2·39
Innisfail	2·98	40	5·59	3·16
Mossman	3·10	13	4·10	3·19
Townsville	1·19	50	5·78	1·23
Central Coast.				
Ayr	0·95	34	3·57	3·42
Bowen	1·03	50	3·41	0·92
Charters Towers ...	0·66	39	3·29	0·68
Mackay	1·88	50	1·79	2·82
Proserpine	1·75	18	2·88	2·46
St. Lawrence ...	1·87	50	2·08	3·58
South Coast.				
Biggenden	2·32	22	1·83	5·45
Bundaberg	2·11	47	1·82	3·27
Brisbane	2·62	70	1·36	2·16
Childers	2·52	26	1·47	9·27
Crohamhurst ...	3·61	30	1·93	8·14
Esk	2·47	34	1·08	5·86
Gayndah	2·44	50	0·89	5·17
Gympie	2·77	51	2·61	4·81
Glasshouse M'tains	2·95	13	1·65	6·08
Kilkivan	2·69	42	1·97	3·77
Maryborough ...	2·77	50	0·73	4·25

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1921	Oct., 1920.
South Coast—continued:	In.		In.	In.
Nambour	3·20	25	1·82	7·29
Nanango	2·35	39	0·99	2·66
Rockhampton ...	1·86	34	3·35	4·19
Woodford	2·65	34	1·20	3·12
Darling Downs.				
Dalby	2·12	51	1·36	2·64
Emu Vale	2·34	25	1·78	2·79
Jimbour	1·88	33	1·02	2·62
Miles	2·01	36	1·29	3·27
Stanthorpe ...	2·59	48	4·16	2·07
Toowoomba ...	2·68	49	1·33	3·82
Warwick	2·25	34	2·57	2·52
Maranoa.				
Roma	1·74	47	1·87	3·43
State Farms, &c.				
Bungeworgorai ...	1·32	7	1·23	3·04
Gatton College ...	2·32	22	0·67	3·68
Gindie	1·44	22	0·40	5·97
Hermitage ...	1·96	15	2·50	2·95
Kairi	1·06	7	2·66	1·27
Sugar Experiment Station, Mackay	1·71	24	1·60	2·15
Warren	2·81	7	1·10	5·46

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

LAGUNARIA PATERSONII.

NATURAL ORDER MALVACEÆ (Mallow and Hibiscus Family).

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—*Lagunaria*, a name given on account of its similarity to *Lagunœa*, a genus now included under Hibiscus, so called in honour of Andres de Laguna, a Spanish botanist, 1499-1560. *Lagunaria Patersonii* is described in the "Botanical Magazine" T. 764 (1804), under the name of *Lagunœa Patersonii.* The specific name is in honour of Colonel Paterson, a former Lieutenant-Governor of New South Wales, who collected seed at Norfolk Island and took it to England in 1792 (according to Endlicher, Prod. Norf., p. 75), where it first flowered in 1801.

Description.—(Bentham's "Flora. Austr.," I., 218) "A tree, the young parts and inflorescence more or less covered with minute scurfy scales, but otherwise glabrous. Leaves petiolate, oblong or broadly lanceolate, rarely ovate oblong, 3 to 4 in. long, entire, somewhat coriaceous, white underneath when young, glabrous and pale green on both sides when full grown, the scales of the under-surface almost disappearing. Pedicels very short and angular, bracteoles three to five, very obtuse, united in a broad, shortly-lobed cup, usually persistent at the time of flowering, but sometimes these fall off early. Calyx four to five lines long. Petals narrow, above 1½ in. long, slightly tomentose outside."

Flowers.—These are large, about 2 in. across, of a delicate lavender-pink, fading to almost white; the tree is very floriferous, producing numerous flowers for several weeks; they are borne at the axils of the leaves, and quite a long succession of bloom is provided; the flowers are very attractive to bees, and when in flower a large tree will provide at early morning a humming noise similar to the swarming of bees.

Seeds.—The seeds are borne in a capsule similar to that of the rosella; attached to the inner portion of them are numerous short barbed hairs, that will attach themselves to the skin, and are very irritating, being not unlike those of the velvet bean (*Mucuna pruriens*), commonly called "Cowitch." The seeds are also similar to those of rosella.

Timber.—"Wood firm, close in grain and nearly white, easy to work, would be useful." (Bailey's "Queensland Woods," No. 20.)

Bark.—Like a number of the plants of this Order, a very fine fibre can be obtained by maceration.

Habitat.—Queensland, in the neighbourhood of Bowen, and at Norfolk Island. Bentham, in "Flora Austr.," remarks on several small differences between the Norfolk Island form and the Queensland one. Backhouse, in his "Narrative of the Australian Colonies," 258 (1835), writing of Norfolk Island, says: "Scattered on the grassy hills is hibiscus, or *Lagunœa Patersoni*, which forms a spreading tree of 40 ft. in height. It is called "White Oak," its leaves are of a whitish green, and its flowers pink, fading to white, the size of a wineglass; it is, perhaps, the largest plant known to exist, belonging to the Mallow tribe. In a thick wood, I met with it 80 ft. high, and with a trunk 16½ ft. round."

In the Brisbane Botanic Gardens there is a fine specimen between the centre island pond and the river; it is from 45 to 50 ft. high, with a spread of about 40 ft. It flowers during October and November, and although not such a striking feature as some more vivid flowering trees, is decidedly a very beautiful sight when in flower, with its dense masses of lovely soft lavender-pink blooms, that are, however, much smaller in size than that given of the Norfolk Island form.

Propagation.—From seed or by cuttings, the tree is very suitable for street or general planting, being of compact growth, attractive appearance, and particularly free from insect pests. Mr. J. H. Maiden, in the "Forest Flora of New South Wales," Vol. I., 113, strongly advocates its planting for these purposes, saying: "The tree is very shapely, and ornamental in appearance, and is worthy of being planted

far more extensively than it is.'' When in Adelaide in December, 1919, Mr. J. F. Bailey drew my attention to a number of very fine specimens that are planted along North Terrace alternate with *Sterculia diversifolia* (Kurrajong), two Queensland trees that I am afraid have been rather neglected in their homeland.

GARDEN NOTES.

FLOWER GARDEN.—Although not a busy time for seed sowing, a few things can still be planted, such as balsams, cosmos, marigold, zinnias, celosia, and portulacca. This latter can be obtained in many rich colours, and pleasing effects may be made by grouping them in separate colours. To do this it is necessary to transplant soon after the plants commence to flower; they can be used with good results grown on newly planted rose beds in exposed situations, as the succulent green plants afford considerable shade to the surface and protect the ground from hot summer sun, without unduly robbing the roses.

Take advantage of a showery day to plant out flowering annuals available. If necessary, the plants can be sheltered by a small piece of leafy bush. Chrysanthemum planting should be finished; have stakes ready for staking when necessary. Liquid manure, occasionally applied, will put good growth into chrysanthemums, and amply repay the trouble with better flowers. Keep asters and dahlias moving, and give plenty of water in the evening. Remember, a good soaking every other day is far preferable to a light sprinkle daily. Dahlias must have a well-drained situation, and if planted in exposed situations, mulch the surface around the plants to keep the bulbs cool. Coleus and croton cuttings may be put in. Both these plants are worthy of more consideration than they seem to get; the former revel in a sheltered situation, while the latter like plenty of sun, but protection from strong winds. A suitable place should be: Morning sun up to about 2 p.m.

Lift gladioli bulbs as they ripen after flowering, and store in a dry place. Interesting work can be accomplished by the raising of seedling gladiolis, and many good kinds can be looked for if the seed is from a decent strain. In our climate the seedlings come to maturity and flower much sooner than in colder localities. Hippeastrums also provide a good field for experiment, and many beautiful kinds may be raised from selected seed.

In the bushhouse, caladiums should now be making good growth. Keep well supplied with water, give liquid manure about once a week, and cut off all flower stems as they form, unless they are wanted for seed. The growing of caladiums from seed is fascinating work, and fine results are obtained by cross-fertilisation. In selecting for this purpose, have one variety of good strong growth, without reference to any great beauty, and then cross with pollen from one of the delicate rich-coloured leaf kinds; cross both ways. Better results will follow from this system than by having two rich, delicate kinds. When potting caladiums use a rich, good leaf or turf compost, plenty of fibre through it; also small charcoal. Do not use a dense, close-setting soil; have it free and porous.

TOMATO SOUP.

An excellent product of the Returned Soldiers and Sailors' Co-operative Cannery at Stanthorpe is tomato soup, samples of which have been received at this office.

This high-quality product, well canned and attractively labelled, is rapidly establishing itself on the market as a culinary necessity, and is being favoured with a strong home demand.

WEED IDENTIFIED.

The Government Botanist, Mr. C. T. White, F.L.S., advises as follows on a weed send by Stock Inspector F. H. Singh for identification:—

''The plant sent by Inspector Singh is the fumitory (*Fumaria parviflora*), a weed fairly common in the cooler parts of the State. It is a native of Europe, and is not known to possess any harmful properties. In England it was at one time largely used as a herbal medicine for various complaints.''

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, who has been officially visiting the Sugar Experiment Stations at South Johnstone, Mackay, and Bundaberg in connection with the work of those institutions, the initiation of new experiments, and the collection of data, has returned to Brisbane. In addition to the abovementioned the sugar districts of the Herbert, Johnstone, Babinda, Cairns, and Mossman were also visited, as well as the entomological laboratory at Meringa.

At the Herbert River, although the cane was not cutting out quite so well as anticipated some months ago, it was of good quality, and sugar was being rapidly produced in large quantities for shipment south. Considerably over 1,000 tons per week were being conveyed by tram to the Lucinda Jetty, the large sugar-stores were filled, and steamers were being loaded, the whole scene presenting one of the greatest activity. The cane was being sent in remarkably clean to the Victoria and Macknade mills. No bad topping, adhering trash, or dirt was apparent. Owing to the large amount of rain experienced, the plantings of cane for next season were late, but a large area was being put under.

Disease, in the shape of what is known as ''gumming,'' was seen in many places, notably in connection with the variety known as Clark's Seedling. Grubs were also doing damage in places. Recently the Sugar Experiment Stations shipped Tableland Badila to the farmers' associations at Macknade and Halifax, and this had germinated excellently and was vigorous and healthy. A variety known as H. 409, distributed by the Colonial Sugar Company, has also been planted out to some extent this year.

An excellent caneplanter, invented by Mr. W. J. Enticknap, of Macknade, was inspected and found to be doing fine work. It makes the drill, plants the cane, covers it, and applies fertilisers in the one operation.

The germination of some of the young cane at Macknade this year has been somewhat irregular, but as the cane is still coming through, this may yet make a good strike. The farmers generally are alive to the importance of liming and fertilising, and large quantities of these materials have been purchased this season.

At Mossman the mill has completed this year's crushing, the tonnage of cane operated on amounting to 61,500 tons. They have had a very satisfactory run and experienced good weather during the harvesting. The young cane for next season, of which there is a very large area, looks exceedingly well, and there is every promise at the present time of a good season for 1922. The directors of the mill are turning their attention to supplies of lime, and they already buy and supply quantities of fertilisers to their farmers.

In the Gordonvale district, near Cairns, the young plant cane appeared excellent in growth, the cultivation had been exceptionally good, and all fields presented a clean. attractive appearance. There has been a large area planted for next year. The crops now being treated at Mulgrave and Hambledon were lighter than estimated in the earlier parts of the year, owing to damage by grubs. Some delay was caused at Mulgrave by a cutters' strike; this, however, had ended after about three weeks' lost time at the best part of the season. Preparations for the enlargement of the crushing capacity of Mulgrave next year were going on apace. Matters generally were going smoothly at the Hambledon Mill, and here, also, the young plant cane for next season looked well cultivated and clean, while the area was large. The entomological laboratory at Meringa was inspected, and the buildings and surroundings were in good order. The work is now under the charge of Mr. Edmund Jarvis, who is exceedingly busy in laying out his campaign for the ensuing grub season and also in fighting the weevil, borer of sugar-cane, and other insect pests.

The estimate of the crop at Babinda had also been reduced, owing to excessive rains. From the beginning of January up to the 14th October 230 in. of rain had fallen. This had exercised a most prejudicial effect on the late cut ratoons of last season. The heavy rainfall also caused a good deal of the other cane to fall and die. Up to the time of the General Superintendent's visit towards the end of October, 86,000 tons had been crushed, and it was considered that another 44,000 tons remained

to be put through. The mill authorities expect to finish before Christmas, and this will give the ratoons a far better chance of coming on for next year. The sugar output is expected to be about 13,000 tons. The fibre content at Babinda in the Badila cane is very high, ranging up to 15 per cent. On the whole, the mill has worked very smoothly this year and has done slightly better than last year. Owing also to the heavy rains the plantings for next season have not been so good as last year.

The work of the Sugar Experiment Station at South Johnstone during the past year has been highly successful. The whole of the experiment work in the field has shown a large profit. First ratoon crops are averaging 43 tons per acre, and, but for the excessive rain causing much of the cane to fall and die, the yield would have been much heavier. Seedling work has also been undertaken, and a large number of new seedlings have been propagated and are now being selected and potted out.

A very heavy distribution of varieties to farmers in the Northern districts was made this year, no less than 22 tons being given out in small packages to growers. A heavy crop has been harvested and sent to the mill, both from experiment plots and land reserved for revenue purposes. The chemist in charge of this station, Mr. P. H. McWalters, had had a strenuous time during the year, and has carried out his duties with considerable zeal, energy, and ability.

The rainfall on the Johnstone River has not been so great as at Babinda, but it has been an excessive rainfall, nevertheless, amounting to 180 in. This has made the plantings for next season very late. Two strikes have occurred in this district—viz., at South Johnstone and Goondi, which have further delayed matters generally. However, both have been settled, and work is now being rapidly pushed on. The young cane is looking well and growing rapidly. The whole district is in a most flourishing state at the present moment, and large sums of money will be circulated this year.

At Mackay the district generally was looking splendid, and the cane has improved considerably since July, so that the mills have increased their estimates from 50,000 tons of sugar to 57,000 tons. Large areas of cane have been planted for next season, and the prosperity of the district is most marked.

The work at the Sugar Experiment Station at Mackay has been also most successful, and heavy crops are being cut. The distribution work has also attracted considerable attention. The variety known as Q. 813 sent out from the station a few years ago is coming into great prominence, and large areas are being planted. Mr. T. A. Powell, a grower on the North Side, cut 300 tons of this cane during the present season, averaging 40 tons per acre, with a commercial sugar content of 15.7 per cent. average. At the Palms Mill this variety has given from 16 to 16.3 c.c.s., and the manager intends planting out considerable quantities this year. The chemist in charge of the Mackay Station, Mr. F. Keogh, has (in addition to his usual duties, which he has carried out satisfactorily) made over 300 tests of cane juices for farmers, as well as analyses of soils and fertilisers.

The opening of the train service to Mackay is attracting considerable notice to the Mackay district, and will undoubtedly prove the greatest blessing to the town and country. Many landseekers held off Mackay in the past owing to its difficult port, but now it is in railway communication with the southern capitals, this fine cane district will come into its own. The change from the discomfort so often experienced at Flat Top Anchorage to the certainty of train travelling is greatly appreciated by all whose business takes them to Mackay.

At Bundaberg the cane had also improved during recent months, and the mills were dealing with larger crops than originally anticipated. Rain, however, is now urgently required for the young cane, of which a great deal has been planted for next year. The sugar experiment station has nearly completed its cutting for this year, a fine average crop having been harvested. The chemist in charge, Mr. J. Pringle, has carried out his work with care and energy, and the chemical work this year has been heavy.

Summing up, Mr. Easterby remarked that what may be termed the Southern districts, below Townsville, were generally cutting out heavier crops than originally estimated, while the districts above Townsville, owing to exceptional wet, were somewhat under the estimate, although the crops were good.

The prosperity of the sugar industry this year was something Australia had to be grateful for, seeing that the wool, mining, and meat industries were all depressed. The sugar industry was circulating immense sums of money, not only around the sugar-mills, but in many parts of Queensland and Australia, its indirect benefits being felt in other States as well as our own. It is, therefore, sincerely hoped that this great Australian industry will continue to flourish by the guarantee of its stability.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

"*Babinda.*—In last month's report I mentioned that, owing to such a heavy wet year, the tonnage to be put through by the Babinda Central Mill would be under earlier estimates.

"In connection with this, the following rainfall figures are decidedly interesting:—

The total fall from 1st January to 30th September	227.61 in.
Average fall for six years for the same period ..	119.38 in.
Fall for month of September, 1921	11.07 in.
Average fall for six years for September	6.88 in.

"These figures give an idea of the great quantity of rain that has fallen, and also the difficulty that the management has had to contend with, in order to keep up an adequate supply of cane for constant crushing purposes.

"Early in the month (October) a spell of fine weather set in, making harvesting conditions more normal, and giving the cane a chance of improving in quality. With the advent of these favourable conditions, ploughing, planting, and weeding operations were soon in full swing, hands doing their utmost to benefit by this very needed change.

"In the northern end of the Babinda area the recently cut cane was ratooning well, and some very good young plant cane was also seen. Although this end has often been damaged badly by grubs in the past, the injury caused by them this year was not great.

"Probably the amount of rain that fell so continually minimised their damaging efforts. A good number of borers was noticed in this area.

"D. 1135 has recently been planted in much larger quantities, growers claiming that it is a good striker, and certainly stands up to the grubs better than any other variety.

"The area formerly known as the "Bartle Frere Estate" looks extremely well. A lot of very fine Badila is still waiting to be cut, both on the light red volcanic soils and also upon the rich deep alluvial flats. The ratoons are coming away very well, whilst some very nice plant cane was also seen.

"Around Babinda proper a lot of new houses have been built lately, and many more also are in course of erection. The demand for new houses is very keen, any vacant one being eagerly snapped up. The State hotel has also added to its already fine accommodation, to satisfy the needs of the great number of the travellers continually passing through this important township, and the general expressions of satisfaction say much for the popularity of this public utility.

"*Freshwater.*—This district is now making very rapid progress, as the lately completed tramway bridge over the river at Stratford brings a further area of land more into direct touch with the district. The bridge spans over 600 ft., and as the entire cost so far has been borne by the owners of three farms, they are to be complimented upon their progressive policy.

"There will not be a great deal of cane brought across the bridge this year, but as there will be somewhere in the vicinity of 260 acres of land under cane in this particular locality for next year, it will be readily seen how important an undertaking it is. Most of the soil is first-class deep rich alluvial, and the young plant cane looks splendid, it having struck well and has been kept free very nicely from weeds. A shower of rain about the middle of the month also helped it along. Although, as before-mentioned, only three farms are located just here, they are well up to date, and employ tractor-power. As the soil here is very free and loose, it will be seen how popular the use of tractors is becoming, for they are being used for ploughing, cross ploughing, drilling, and planting in this class of country with every success.

"Farther up Freshwater Creek a further large area of new land is being opened up, and some magnificent young plant cane was noticed upon Mr. D. O'Hara's farm. It has struck remarkably well, is perfectly clean, and looks most healthy. As most of the areas about here were citrus orchards last year, and are now growing cane, it will be seen that no time has been lost by the growers to obtain such good results. In

the near future some very big crops of cane will be harvested from the Freshwater areas.

"*Hambledon.*—Crushing is proceeding satisfactorily, no strikes or labour troubles having so far caused any delay, and the mill expects to finish shortly prior to Christmas time. At time of my visit some very hot weather was being experienced, making harvesting conditions anything but pleasant. Quite a number of tractors are being used in this area, and their usefulness was much appreciated in the course of the hot spell.

"Although the grubs did a lot of damage to this and adjacent areas this season, it is remarkable how very well the cane is ratooning.

"The large area of young plant cane also looks well. A good deal of D. 1135 is being planted again this year, and a large number of the growers have obtained supplies of new varieties of cane from the experimental station at South Johnstone, with a view to trying same under local conditions. Unfortunately, several farmers were unable to get any plants, not having applied in time.

"Probably more manure is being used in the district this year than ever previously, and basic super meatworks, dried blood, and ammonia and others have been ordered in large quantities.

"*Gordonvale.*—There is still some very fine cane to be harvested. A patch of Badila (plant) on Mr. Sue's farm will probably cut between 50 and 60 tons to the acre. This block has been under cane for a very long time, but has been treated with filter press, had green corn ploughed in, and also had the advantage of about 10 cwt. meatworks manure to the acre. Mr. T. Shepherd, on Highleigh, claims that he has obtained some very good results from Malagache on his farm. The soil is light and porous, and was originally all forest. Mr. Shepherd's figures are—

Plant	25.0 tons per acre.
1st Ratoons	26.0 tons per acre.
2nd Ratoons	24.0 tons per acre.
3rd Ratoons	16.0 tons per acre.

" The ratoons now coming on look very healthy. Density figures for the cane were very fair.

"*Aloomba.*—Wet weather had again set in, interfering with harvesting of the present crop, and also with the cultivation of next year's cane. A good deal of young cane has been planted, a big proportion of it being D. 1135, and in most cases the strikes have been fairly good. Quite a number of farmers have also planted out new varieties obtained from the South Johnstone Experiment Station. Among these were noticed Q. 813, E.K. 1, E.K. 28, 7 R. 428, Q. 903, Tableland Badila, Hybrid No. 1, and Badila Seedling. The results of their growth will be watched with interest.

"Taking this year throughout, the weather experienced in North Queensland has been anything but favourable to canegrowing. At time of writing, rain is still threatening, making conditions very uncomfortable for the man on the land, and an early return to normal November weather is very much desired."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"In the course of the month of October as much of the Mackay district as time and weather conditions permitted was visited.

"The sugar industry in this important centre is progressing more satisfactorily than has been the case for some years. The present harvest is a good one, and the c.c.s. values in the different varieties of cane are gratifying. The various mills have reached a high standard of efficiency, and the supervising chemists are to be congratulated on the percentage of extraction. Labour, taken on the whole, is efficient at Mackay this year, and no serious industrial trouble has occurred.

"The growers this year are realising more than ever the necessity for more scientific farming, and matters to which the average grower has not hitherto given much thought are being discussed and studied. Most important in this respect is the endeavour being made on the part of planters to obtain adequate supplies of lime. The obtaining of burnt lime prior to the rail coming through from the south

was almost an impossibility, but this now will be more readily obtained, and will add to the many advantages already conferred on the district by the railway. There is at present a good deal of discussion among the farmers as to which is the better to use, burnt lime or pulverised limestone.

"The former is of the more agricultural value, for the following reasons:—No amount of mechanical pulverising can reduce limestone to an equal fineness to that obtained in burnt lime that has been airslaked. On slaking, burnt lime falls into a very fine powder. When it becomes converted into a carbonate it still retains its powdery condition, and can be spread over a large surface and mixed freely with the soil. By burning, lime is brought into a caustic state. In this condition its action upon the soil and upon organic matter is more vigorous than pulverised limestone; in fact, it will bring about results in some soils that the latter would not produce at all.

"Dealing with cane varieties in the Mackay district, there are a number of canes paying the farmers well. The best of these include Q. 813, 1900 Seedling, Clark's Seedling, H.Q. 285, and D. 1135. There are a number of other promising varieties, however, that have been distributed of recent years from the Mackay Experiment Station, and these include B. 3747, Q. 1092, Q. 695, Q. 1098, Q. 135, Q. 1133, B. 3922, Q. 1121, Q. 970, N.G. 83, N.G. 103, Q. 813, Q. 458, Q. 659, N.G. 130, Q. 855, Q. 903, and M. 189. Malagache is also a variety making a good showing in some parts of the district. Yuban is growing on many farms, but ought to be rapidly discarded for reasons well known to those who grow it.

"The ratoons on many farms are coming shyly this year, and the growers are considering the application of chemical fertilisers in the form of sulphate of ammonia or nitrate of soda. I would like to make remark on the comparative value of these fertilisers.

"Regarding cane pests in the Mackay district, these appear to be causing a minimum of loss. Cane borers are present in some fields, but are well under control. Other parasites, such as leaf hopper, wire worm, and cane grub are present, but are controlled by natural enemies. In many instances the farmers are destroying the feed trees, and thus checking, to some extent, grub infestation.

"It is noticeable in a number of instances that farmers do a great deal of cultivation in young plant cane with the plough. On one hand, from the growers' point of view, this expedites the weeding and saves labour, but on the other the process is really harmful and ought to be discontinued, if possible. The harm done by this process has often been pointed out, and better tonnages would be obtained from crops that have had more careful cultivation in their early stages."

SUGAR: THE 1921 CANE YIELD.

It is interesting to compare the yield of cane in the different districts this year. It will be noticed, from the table given below, that the principal canegrowing areas are Mackay, Innisfail, Babinda, Lower Burdekin, Bundaberg, and Childers. The sugar districts north of Townsville will produce 896,000 tons of cane, while those below will yield 1,378,500 tons:—

APPROXIMATE TONNAGES OF CANE BEING CRUSHED IN THE DIFFERENT DISTRICTS DURING THE PRESENT SEASON.

	Tons.
Mossman	62,000
Cairns	176,000
Babinda and Innisfail	440,000
Herbert River	218,000
Lower Burdekin	303,000
Proserpine	60,000
Mackay	464,000
Bundaberg and Isis	479,500
Maryborough and Mount Bauple	24,000
Moreton	36,000
Beenleigh	12,000

Botany.

A NATIVE YAM.

By C. T. WHITE, F.L.S., Government Botanist.

The Instructor in Agriculture for Central Queensland (Mr. G. B. Brooks) has recently forwarded me specimens of a scrub yam, with the following report:—"I am sending a small tuber and piece of foliage of a scrub yam procured in the Dawson Valley district. In certain scrub areas they are to be found—on breaking up the land for the first time—in very large quantities. In size they are similar to the sweet potato. Pigs are said to be fond of the tubers, while the cattle strip the vines of leaves as high as they can reach. I have forwarded a few tubers to the Agricultural Chemist for analysis. In all probability a short description may be of interest to readers of the "Agricultural Journal."

The yams are the root tubers of *Vitis opaca,* a species of native grape common in coastal Queensland. The plant is very variable in the shape of its leaves and in the size of the tubers produced, and it is possible that several distinct forms or races occur. The yams sometimes attain a very large size; one collected near Redcliffe by Mr. E. W. Bick turned the scale at a little over 20 lb. weight. In the early days the yams were said to be eaten, both raw and cooked, by the aborigines. They have, however, comparatively little actual food value, as the following analysis by the Agricultural Chemist (Mr. J. C. Brunnich) shows:—

ANALYSIS OF SCRUB YAM (*VITIS OPACA*).

	Per cent.
Moisture	95.0
Crude Protein	0.75
Carbohydrates	2.23
Crude Fibre	1.08
Crude Fat	0.02
Ash	0.92

The vine also occurs in New South Wales, and is the subject of a paper by Messrs. Baker and Smith in the "Proceedings of the Royal Society of New South Wales," Vol. 40, pages 52-60. Their analysis of tubers from New South Wales plants is much the same as that given by the Agricultural Chemist.

Other Queensland species of *Vitis* produce enlarged tubers or rootstocks; Dr. Roth states that those of *Vitis acetosa* are hammered on stones and then roasted by the natives about Princess Charlotte Bay. He also states that the tubers of *Vitis trifolia,* another tropical species, are "roasted on the ashes lying over heated antbed 'chunks' or stones. The ashes are subsequently removed, the roots left on the antbeds, &c., and covered with a sheet of tea-tree bark and left to bake. The thick cortical substance is removed before eating." *Vitis clematidea* is a species common along the sea-board of New South Wales and Queensland. It produces tubers which were largely used as food, after cooking, by the aborigines.

RAT ERADICATION.

Another effective method of exterminating rats is described in the current "Poultry" as follows:—

"Put down a tempting bait and surround it with a ring of caustic soda. Outside the ring of soda place a ring of wet rags or bags. The rat, to reach the bait, must walk over the wet bags, and so wet his feet. He then walks over the caustic soda, which, of course, burns him. He will next lick off the irritating substance, and becomes a dead rat. The same procedure may be adopted at the main entrance to a rat's tunnel. Close up all the holes possible, and put wet rags at the entrance, and soda outside, and then the bait."

Entomology.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (12th November, 1921) from the Entomologist, Mr. Edmund Jarvis:—

"The warmth experienced here during the past few weeks has raised the soil temperature, and so favoured an early transformation of the pupæ of our cane beetle (*Lepidoderma albohirtum*) to the imago or beetle state. The average shade heat between the dates 10th to 17th October was 84 degrees Fahr., a temperature exceeding, indeed, that which normally obtains during our summer months. Such conditions being accompanied by a precipitation of 2.79 in. of rain, it seemed likely that about 50 per cent. of the beetles might make an early emergence. Apparently, however, this heat has not been sufficient to arouse them from a torpid state, as up to the present (28th October) no decided emergence has taken place. The past winter having been somewhat cooler than usual, it is quite possible that the beetles may not appear until early in November.

"CONDITIONS AT GREENHILLS.

"The cane on this estate, which at present consists of about 160 acres of ratoon and 90 of plant cane, is making splendid growth, the September planting being already about 3 ft. high. Mr. Hoelscher, the manager, is experimenting against the grub by burying a layer of trash directly underneath the cane, the trash being first placed in a trench, and covered by a layer of soil, on top of which the 'sets' are then planted in the usual manner. Several rows have been treated in this way, and a number of the adjoining rows left untreated to act as a check plot. About 600 acres are to be placed under Mauritius beans, one-third of this area having already been sown. The whole of the crop will be ploughed under in due course, and followed by cane to be planted early next year, when it is hoped that the grubs may feed on the humus supplied by this green manure and leave the cane alone. At present very few grubs of any sort are showing up in the furrows, and no beetles have been noticed.

"LARGE MOTH-BORER OF CANE.

"This insect, which is sometimes confused with the beetle-borer of cane, is, unfortunately, giving trouble just now in the Lower Burdekin and Bundaberg districts. Growers writing from Rita Island state:—'This pest has gradually become worse until this season, when areas in one patch have been destroyed.' 'They are very bad on my farm this year, attacking the young plant cane as soon as it is out of the ground; they clean out patches completely. They are also bad on the adjoining farms.' The larva of this moth-borer (*Phragmatiphila truncata* Walk.) does not in the least resemble that of the beetle-borer, the former being a slender caterpillar about 1½ in. long, while the latter is a plump maggot-shaped grub. The moth-borer usually attacks young ratoons and plant cane, killing the central unfolding leaves, which quickly wilt and turn brown, such plants finally exhibiting what is termed 'dead-hearts.' When occurring in big cane it is generally found boring the top of the stalk. The beetle-borer, however, seldom attacks very young shoots, and when infesting mature cane is most often seen tunnelling the basal portion.

"The moth-borer is common here in canefields, but appears to be effectively controlled by natural enemies, amongst which the well-known ant, *Pheidole megacephala*, may be considered as being an important factor. The writer has also bred from parasitised caterpillars found in bored cane at Pyramid, a tachinid fly, and a braconid wasp parasite, *Apanteles nonagrinæ*. The latter insect has previously been described as a parasite of this moth-borer in New South Wales, but has not, I believe, been recorded hitherto from Queensland.

"Judging by reports to hand regarding the mode of attack manifested by this pest on the Lower Burdekin, it appears likely that two at least of the abovementioned natural enemies do not occur there.

"We intend, therefore, to collect specimens of the parasites in question at Pyramid, and, upon obtaining same, breed them here until getting a sufficient number to convey to Rita Island for liberation on plantations where this borer is troublesome. A special breeding-cage, including about 90 cub. ft. of space, is being constructed for this work, and will contain cane plants growing naturally in soil about 9 in. deep, in order to secure ideal conditions for breeding these parasites.

"CONTROL OF THE ADULT BEETLE.

"One of the phases of control we propose investigating this coming season is that of poisoning the adult beetles before they have had time to oviposit. Experimentation in this connection will include field as well as laboratory work. Beetles will be confined separately in cages containing favourite food-plants which have been sprayed with various poisons, while feeding-trees in the forest will also be treated with similar arsenical solutions.

"Preliminary experiments of this nature were initiated by the writer in 1915 ('Australian Sugar Journal,' Vol. VII., page 62) when it was found that arsenate of lead-molasses solution proved fatal after nine days, during which time sixty-nine beetles devoured 32 sq. in. of the poisoned leaves (about ½ sq. in. to each insect). This spray, although slow in taking effect, would, nevertheless, be serviceable if administered to beetles directly they appear, as a period of about fourteen days elapses between emergence and oviposition. It is hoped, however, to discover an insecticide this season that will prove fatal in a week or less.

"It may be mentioned in this connection that amongst the numerous native food-plants of albohirtum there are two which invariably attract great numbers of beetles, viz.:—*ficus pilosa* and *ficus nesophila.* Growers who intend to collect beetles invading their canefields could not do better than plant clumps of three or four of these fig-trees on headlands or among their cane at convenient distances apart. Such trap-trees should be pruned occasionally in order to keep the heads low and spreading; and could either be collected from during the flighting season or sprayed with some suitable arsenical upon the first appearance of the beetles. Cuttings were taken from both these figs a few months back in order to see if they could be easily propagated, some being root-grafted in the ordinary way and the remainder planted without special treatment. Both methods proved successful, and I had no difficulty in 'striking' a larger percentage of these cuttings. Next season we hope to be in a position to supply young trees of both these figs, free of cost, to any growers who may care to plant them.

"BREEDING OF BORER PARASITES.

"Examination on the 25th instant of cane sticks that had been artificially stocked with grubs of the weevil-borer, and planted on 14th September in a large breeding-cage, revealed the presence in each stick of pupæ of the tachinid fly, *Ceromasia sphenophori.* These pupæ, which resulted from maggots deposited by flies collected and brought by the writer from Babinda on 22nd September, will produce parasites about the end of this month (October) and constitute our first brood for the season. The life-cycle, from larva to perfect insect, has taken, in the present instance, about forty days, but successive broods should come through during the hot weather in about five weeks. Flies forming the first brood will be used for breeding from, but it is hoped to have specimens available for distribution before next season's cane is old enough to sustain serious injury from borer attack.

"FUMIGATING PUPÆ OF CANE-BEETLES.

"In my August report allusion was made to successful laboratory experiments against the pupæ of albohirtum, our common 'grey-back' cane-beetle. Preliminary field tests conducted during September demonstrated that the fumes of carbon bisulphide are able to penetrate the walls of the pupal chamber, and injections made at a depth of 8 in. proved fatal to pupæ lying at an average depth of 11 in. Owing to prolonged wet weather these experiments had to be discontinued, but the matter will be followed up next season with view to securing further data.

"MULGRAVE NOT COLLECTING BEETLES.

"At a meeting of the Cairns Cane Growers' Association, held at Gordonvale on the 25th instant, the Mulgrave growers decided not to collect beetles or grubs this season. Such action is very regrettable, and it is to be feared that, in the event of dry weather obtaining during the period occupied by the third stage of the grub, many growers may suffer serious losses. The emergence of albohirta last season was the biggest yet observed by the writer during the past seven years, but, unfortunately, prolonged wet conditions promoted rapid growth, and in many cases the cane had attained a good length before the grubs were large enough to do much damage. Again, later on, during the critical period showers and cloudy days kept the tops green, and sticks that had fallen were able to root afresh and keep alive until crushing time. Judging from past experience in this and other countries, we may reasonably infer that cane-beetles are likely to appear this season in very great numbers."

General Notes.

WHEAT BOARD ELECTIONS.

The election of representatives on the Wheat Board, held on 26th November, resulted as follows:—

No. 1 DISTRICT.

Primary Votes.

McKeon	56 votes
Ashmore	31 "
McAnnally	125 "
Swan	257 "
Informal	7 "
Total	476 "

Number of ballot-papers issued	661
Percentage of electors	72 per cent.

As Mr. Swan therefore secured an absolute majority in the primary count, there was no necessity to count the contingent votes.

No. 2 DISTRICT.

Mr. Harvey was returned unopposed.

No. 3 DISTRICT.

Primary Votes.

Angus	23 votes
Mahony	55 "
White	85 "
Head	110 "
Kirkegaard	193 "
Informal	16 "
Total	492 "

Number of ballot-papers issued	657
Percentage of electors	74.9 per cent.

As no candidate received an absolute majority of votes, the three lowest candidates—Messrs. Angus, Mahony, and White—were struck out in accordance with the regulations governing the ballot, and the counting of their contingent votes resulted as follows:—

Angus's votes—		
For Kirkegaard	8	
For Head	7	
Mahony's votes—		
For Head	8	
For Kirkegaard	21	
White's votes—		
For Head	27	
For Kirkegaard	22	
Total for Kirkegaard		51
Total for Head		42

This, added to the former totals of Messrs. Kirkegaard (193) and Head (110), made the final totals of these gentlemen as follows:—

Kirkegaard	244
Head	152

Mr. Kirkegaard, therefore, being duly elected with a majority of 92.

No. 4 DISTRICT.

Primary Votes.

Muir	276 votes
Russell	126 ,,
Keable	118 ,,
Roche	122 ,,
Informal	6 ,,
Total	648 ,,

Number of ballot-papers issued	821
Percentage of electors	78.9 per cent.

As, therefore, no candidate received an absolute majority of votes, the two lowest candidates were again struck out, and the counting of their contingent votes resulted as follows:—

Keable's votes—		
For Muir	47	
For Russell	13	
Roche's votes—		
For Muir	46	
For Russell	12	
Total for Muir		93
Total for Russell		25

These, added to the previous totals of Messrs. Muir and Russell, made the final reading as follows:—

Muir	369
Russell	151

Mr. Muir being, therefore, elected with a majority of 218.

No. 5 DISTRICT.

Primary Votes.

Chamberlain	245 votes
Hart	188 ,,
Garvey	100 ,,
Informal	1 ,,
Total	534 ,,

Number of ballot-papers issued	764
Percentage of electors	69.9 per cent.

Again, as no candidate received an absolute majority, it was necessary to cut out Mr. Garvey, the lowest on the list, and the counting of his contingent vote resulted as follows:—

For Chamberlain	26
For Hart	14

making the final totals—

Chamberlain	271
Hart	202

Mr. Chamberlain was, therefore, elected with a majority of 69.

Answers to Correspondents.

"PATTERSON'S CURSE."

''ANXIOUS'' (Freestone).—

The Government Botanist, Mr. C. T. White, F.L.S., has identified the weed sent by you as *Echium violaceum*, known in New South Wales as ''Patterson's Curse'' or ''Blue Weed,'' and in South Australia as ''Salvation Jane.'' It is one of the worst weeds in the Southern States. It has been established in Queensland for some years, but does not seem to spread so rapidly here. It is a native of the Mediterranean, and was probably brought to Australia as a garden flower. Where it makes its appearance, every effort should be made to prevent its spreading. It does not possess any poisonous properties.

HERD TESTING.

L.M. (Millaa Millaa, *viâ* Cairns) asks: ''What is the method of determining a fair average test of a cow?''

It is presumed that the word ''test'' means the percentage of butter-fat contained in the milk of a cow. If such is the case, the average butter-fat content of the milk of the cow may be determined with a fair degree of accuracy by taking, from time to time, what is known as a composite milk sample. A 7-oz. bottle containing added preservative, such as formalin, adding three to four drops to the bottle, is necessary. After milking, the milk should be well mixed by pouring from one vessel to another and the sample drawn immediately, and about ½ oz. of the milk is placed in the composite sample bottle upon each occasion the animal is milked. At the end of the week the milk sample bottle will be filled with milk, and the butter-fat content of this milk may be accepted as the average butter-fat content of the milk yield of the animal for the period over which the test extends.

A series of such tests may be made during the lactation of the animal, and, in turn, the average butter-fat content may be obtained from the results thus obtained, and thereby the average butter-fat content of the milk may be arrived at.

RUSSELL RIVER GRASS.

MR. C. HOPKINS (Pomona) writes:—''I am sending for identification specimens of a grass that sprung up at a place where I unloaded banana suckers from North Queensland. The grass is eagerly eaten by stock, and seems to be hardy, as it holds its own with other grasses and weeds.''

The grass has been identified by the Government Botanist, Mr. C. T. White, F.L.S., as the Russell River Grass (*Paspalum paniculatum*), a species widely spread over the tropical regions of the world, and very abundant on the Atherton Tableland, Russell River, Johnstone River, and other parts of North Queensland. Opinions in the North differ as to its fodder value. On the Atherton dairy country it is looked upon as more or less a nuisance and of little value as fodder. In other parts, however, it is held to be quite a useful feed. It was boomed as a dairy grass suitable for cultivation some years ago, but did not seem to ''take on,'' and is now rarely seen outside of the tropical regions of the State. It was named by the late F. M. Bailey as a new species (*Paspalum galmarra*), but Mr. White cannot separate it from the widely distributed *P. paniculatum*, an opinion recently verified in a letter from Dr. O. Staph, of the Royal Botanic Gardens, Kew, England, the leading botanical authority on grasses in the world.

Russell River grass should prove a useful grass in Southern Queensland, and would add variety in scrub country where Rhodes and *Paspalum dilatatum* may be said to be almost exclusively grown.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

As the wet season is expected to commence this month, provision should be made accordingly.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in ths way will ''trap'' moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing ''hoed'' crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tynes set back at an angle to obviate dragging out of plants, but the work should be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both ''grain'' and ''saccharine'' sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping ''lay-out'' to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture holding capacity of the soil. Planter's Friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass,

or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.—To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Foxhunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COAST DISTRICTS

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept will worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no

acid phosphate (superphosphate) and only a small percentage of bone meal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more Southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit-fly should receive special attention, and an no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in the handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, both in the Brisbane and Coominya districts, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed and the base pips are beginning to show the first trace of colour. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and over-ripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into tight boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

The advice given in the Notes for December, to send nothing but first-class fruit to market, still holds good. With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry much beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good, firm apples shauld stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition, is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case, and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find, when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That is must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out, a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit-fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail, then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6 28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4 56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6 8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6 9	4·46	6·31
7	5·57	5 36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5 54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5 52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6 13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5 40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4 47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6 22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5 35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6 25	4 53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H. M.
2 Sept.	●	New Moon	1 33 p.m.
9 ,,	☾	First Quarter	1 30 p.m.
17 ,,	○	Full Moon	5 20 p.m.
25 ,,	☽	Last Quarter	7 18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10 26 p.m.
9 ,,	☾	First Quarter	6 12 a.m.
17 ,,	○	Full Moon	9 0 a.m.
24 ,,	☽	Last Quarter	2 32 p.m.
31 ,,	●	New Moon	9 39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1 54 a.m.
15 ,,	○	Full Moon	11 39 p.m.
22 ,,	☽	Last Quarter	9 41 p.m.
29 ,,	●	New Moon	11 26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11 20 p.m.
15 ,,	○	Full Moon	12 50 p.m.
22 ,,	☽	Last Quarter	5 54 a.m.
29 ,,	●	New Moon	3 39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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